A CATALOG OF ARMAMENT FROM ANCIENT MEDITERRANEAN SHIPWRECKS, 14th-1st CENTURIES BCE

A Thesis

by

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ABSTRACT

The Mediterranean World is no stranger to naval conflict. In ancient Egypt, Pharaoh Rameses III fought the "Sea Peoples" as they attacked his kingdom and others in the Eastern Mediterranean ca. 1175 B.C.E. Galleys with marines were depicted in art from Bronze Age Crete and warships were shown on Greek pottery as early as The Late Helladic IIIC (c. 1190 – 1060 B.C.E) In the Archaic (c. 650 – 480 B.C.E) and Classical (c. 480 – 330 B.C.E.) periods, the ancient Greeks engaged in massive naval actions against the Persians and amongst themselves. During the Hellenistic period, the *Diadochi* ("successor kings") amassed massive war fleets with gargantuan capital ships as their vied for dominance over the remnants of Alexander the Great's short-lived empire. During Rome's formative years, the Romans engaged in some of the largest battles ever recorded in their wars against Carthage.

However, despite this extensive history of naval conflict in the Mediterranean stretching back to the Bronze Age, the evidence for weapons at maritime sites is sparser than might be expected. While this can in part be attributed to the relative infrequency of shipwreck sites compared to terrestrial ones, it is still a lamentable situation. To compound the scarcity of military finds, wreck sites are overwhelmingly merchant in nature and warships are essentially nonexistent in the archaeological record. However, this is not to say weapons are on unheard of on shipwreck sites. Perhaps due to this relative infrequency, no one has – as of yet – developed a detailed catalog of arms and armor discovered at ancient maritime contexts in the Mediterranean from the Bronze Age to the beginning of the Common Era. It is the aim of this thesis to do precisely that. This catalog will be compared to the literary evidence for the use of weapons and armor at sea.

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CHAPTER I: WEAPONS AT SEA: THE TEXTUAL EVIDENCE

Introduction[1]

Across most periods in the ancient Mediterranean, naval battle was likely conducted with hand-to-hand weaponry in a manner closely resembling terrestrial warfare. Both the Bademgediği krater (Transitional Late Helladic IIIB – C or Late Helladic IIIC Early) (Fig. 1.1) from Turkey and a similarly-decorated Late Helladic IIIC period (1190 – 1060 B.C.E.)[2] krater from Kynos (Greece) (Fig. 1.2), appear to portray naval battles between spear–wielding shipboard marines. The combat on the Kynos and Bademgediği kraters as well as the reliefs at Medinet Habu, Egypt (Fig 1.3), show the use of projectiles (arrows, slings, and javelins) when ships are at range, and hand-to-hand combat using spears and swords when they are in close proximity.[3] However, while iconographic depictions are immensely useful, the majority of our information on these weapons and their use comes from written sources. When analyzing ancient sources, it is important to recognize the use and context of relevant terms, as well potential issues in their interpretation such as terms that - depending on context and period - can potentially refer to multiple concepts or weapons. In light of this, I will discuss the ancient Greek, and occasionally Latin, terms for the weapons or artifacts included in Chapter II and their use in passages relating to seaborne combat. There are relatively few historical Latin documents, as many historians of the Roman Republic (509 – 31 B.C.E.), such as Diodorus Siculus, Plutarch, and Polybius, wrote in Greek.

[1] This thesis follows the citation format of the *American Journal of Archaeology*.
[2] Thesis uses University of Massachusetts chronology divisions/dates
[3] Nelson 1943; Emanuel 2013.

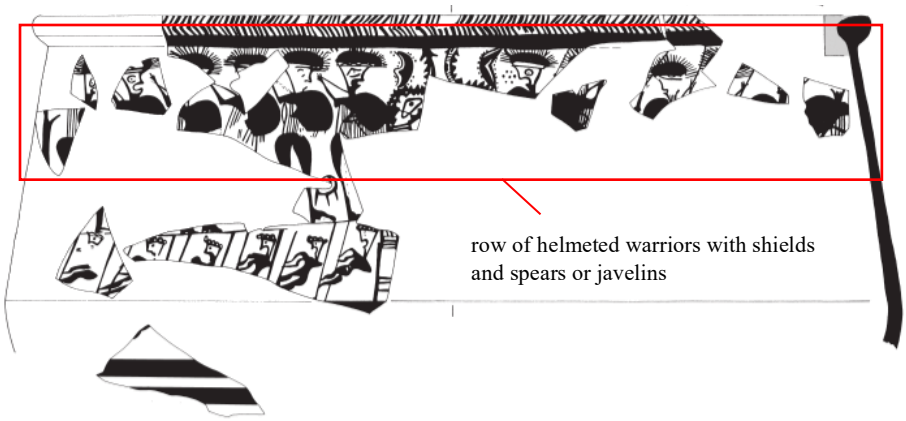


Figure 1.1: Naval scene from the Bademgediği krater (after Mountjoy 2011)

Figure 1.2: Naval scene from the Kynos krater with highlighted peltasts (after Mountjoy 2011)

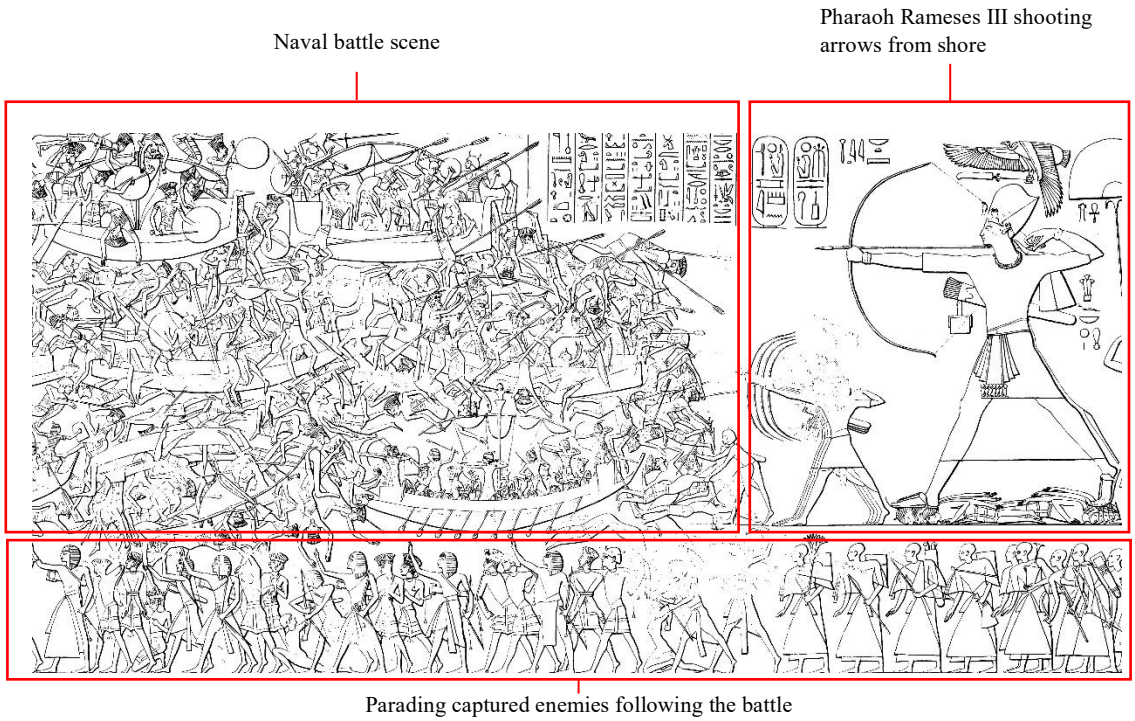


Figure 1.3: The Medinet Habu naval battle relief (after Nelson 1943)

A passage by Diodorus Siculus concerning the clash between the Diadochoi Ptolemy I and Demetrius Poliorcetes at Salamis in 306 B.C.E. demonstrates what can be considered a prototypical progression of combat and use of handheld weapons for engagements between individual ships or small squadrons within a larger battle:

"When the trumpets gave the signal for battle….all the ships rushed to the encounter…using their **bows** and their **ballistae** at first, then their **javelins** in a shower, the men wounded those who were within range; then when the ships had come close together and the encounter was about to take place with violence, the soldiers on the decks crouched down and the oarsmen, spurred on by the signalmen, bent more desperately to their oars. As the ships drove together with force and violence…[some] ships had met prow to prow with their rams…and **the soldiers on board shot at each other** with effect since the mark was close at hand for each party. Some of the men, when their captains had delivered a broadside blow and the rams had become firmly fixed, **leaped aboard the ships** of the enemy, receiving and giving severe wounds; … [others] missed their footing, fell into the sea, and at once were killed with **spears** by those who stood above them; and others, making good their intent, slew some of the enemy and, forcing others along the narrow deck, drove them into the sea." [4]

[4] Diodorus Siculus, *Bibliotheca historica* 20.51.1-4, translated by C.H. Oldfather, hereafter Diod. Sic.

Using Diodorus's description as a general course of action, I will examine the ancient terminology for weapons and armor along similar lines. I will start with projectile weapons (arrows, javelins, etc.) before looking at long-range melee weapons and equipment (i.e. those not requiring the use of projectiles, such as spears and grappling hooks). I will conclude this introductory analysis with close-range melee weapons (swords, axes, and daggers) and armor (helmets, cuirasses, and shields). Before diving into this analysis, however, I will discuss the class of soldier most associated with inter-personnel naval combat in ancient texts, and by extension the class of naval personnel these artifacts are most likely to reflect when they are found in the archaeological record: the marine.

Epibátai (Marines)

The passages that often provide the most detail on the specifics of military equipment are typically preludes to battle, in which ancient authors describe how fleets were formed, manned, and supplied in preparation for conflicts. In such passages, Herodotus and Thucydides both mention a class of naval personnel called *epibátai*, who were heavily-armed sea soldiers or marines in Greek fleets.[5] Later, in the late third and early second centuries B.C.E., Polybius[6] mentions *milites classiarii* ("soldiers of the fleet") as a category of Roman soldiers created and specially armed for hand-to-hand combat aboard warships.

[5] Herodotus, *The Histories* 6.14, translated by A.D. Godley, hereafter Hdt.; Thucydides, *History of the Peloponnesian War* 3.95.2, translated by R. Werner (hereafter Thuc.); Zaccarini 2013
[6] Polybius, *The Histories* 1.26.7, translated by W.R. Paton, hereafter Polyb.

The term *epibátēs* (pl. *epibátai*), while translated as "marine" in military contexts, literally means "one who mounts" or "one who embarks."[7] While this makes sense as marines were crew members who did not contribute to rowing or steering, the term itself provides no direct indication of their role. While the role of rowers and archers in ancient navies and their associated paraphernalia are relatively well established,[8] evidence concerning the *epibátai* is more abstruse. When discussing the combat potential of a Greek trireme at the Battle of Syracuse in 413 B.C.E., Thucydides documents the use of arrows, stones and javelins by "those on the decks" (7.70.5), which is probably a broad reference to both *toxótai* (archers) and *epibátai*.[9] However, the latter were also expected to engage in close combat once ships came into contact ("…once they came close, the *epibátai*, fighting hand to hand, tried to board each other's ship."), either boarding an enemy vessel or defending their own.[10] *Epibátai* could also be used in amphibious assaults as those at Psyttalea in 480 B.C.E.[11] These passages suggest the quality of the *epibátai* which makes them so hard to define – their varied and adaptable tactical role. This flexibility was presumably reflected by the composition of their armament, which could range from melee to projectile weapons.

During the Peloponnesian War (431–404 B.C.E.), at least some *epibátai* were effectively hoplites, the citizen-soldiers that made up the core of ancient Greek city-state militaries (Greek sing. *hoplítés;* pl. *hoplítai*). In 426 B.C.E., 300 Athenian *epibátai* from 30 ships were deployed

[7] Zaccarini 2013.
[8] Krentz 2007, 148; Trundle 2010, 144-8.
[9] Wrightson, Whittaker, & Lee 2015.
[10] Thuc 7.63.1.
[11] Aeschylus, *Persae* 456-7, translated by H.W. Smyth; hereafter Aesch. *Pers.*

as hoplites in Aetolia,[12] where they were supported by archers (also from the ships).[13] The reason this is specified is because Thucydides (7.1.5) comments that *some* Peloponnesian *epibátai* were selected specifically for their hoplite equipment. This, in turn, suggests that others did not possess such armament. There is also some variability in the exact number of marines on board a ship, as Plutarch documents 14 men-at-arms per Attic ship at Salamis in 480 B.C.E.,[14] while the Athenian naval inventories of the late fifth and early fourth centuries report 10 marines per ship.[15] The inconsistent use of standard infantry equipment for *epibátai* also appears to be true for the Romans, as in one example, *epibátai* do not seem to have been regular legionaries. Prior to the Battle of Ruspina in Africa in 46 B.C.E.,[16] Caesar ordered that the Gallic and Rhodian *remiges* (rowers) on board his ships be armed and deployed on land as light infantry *together* with his *epibátai.*[17] The risk of falling into the sea and drowning may have incentivized some soldiers to forego parts of the traditional hoplite panoply while at sea.[18] Herodotus repeatedly refers to *epibátai* employing 'Greek weapons' but, as this is clearly a literary tactic aimed at contemporary audiences familiar with its meaning, he does not elaborate. Herodotus does, however, inform us that a common form of armament was shared at sea among even geographically disparate Greeks, as well as by several foreign peoples. In any naval site associated with warships or battlegrounds, like the Battle of the Egadi Islands (Sicily) in 241 B.C.E., archaeological finds of weapons can create a clearer understanding of how troops at sea, like the *epibátai*, were equipped.

[12] Thuc. 3.95.2.
[13] Thuc. 3.98.1.
[14] Plutarch, *Vitae Parallelae Themistocles* 14.4.1, translated by B. Perrin, hereafter Plut. *Vit. Them.*
[15] Bakewell 2007, 141.
[16] *Bellum Africanum* 20.
[17] Saddington 2009, 124.
[18] Zaccarini 2013, 17.

Projectile Weapons

Bow and Arrow

There are two principal Greek terms for 'arrow' used by ancient authors. The first, *oistós,* is the most directly translatable but appears in limited numbers and mostly in non-military contexts. As mentioned previously, at the Battle of Syracuse (413 B.C.E.) Thucydides documents the use of arrows, as well as stones and javelins by "those on the decks." Thucydides (7.70.5) uses the word *tóxeuma* to describe arrows. This term, predictably, bears a remarkable similarity to *toxótēs,* which translates as 'archer.' Five hundred years later, Plutarch remarks that Marc Antony manned his fleet with at least 2,000 archers in preparation for the Battle of Actium in 31 B.C.E.[19] The root word, *tóxon*, is the Greek term for bow, but was expanded to refer to arrows in some contexts when used in a plural form[20] as well as to archers as a personnel class. Another term, *bélos* is translated most accurately as 'missile' or 'projectile' but was used most commonly in relation to arrows or 'darts.'[21]

Octavian's forces at the Battle of Actium (31 B.C.E.) under the command of Agrippa boasted 16,000 marines and 3,000 archers, a marked increase in the number of dedicated men-at-arms in comparison to reported Classical Greek crews. Ranged combat played a crucial part in the engagement, as there was a noted difference between the size of the vessels in each fleet. Antony's ships were significantly larger and taller than Agrippa's smaller liburnian ships but struggled to close the distance due to the latter's superior maneuverability. However,

[19] Plutarch, *Vitae Parallelae Antonius*. 64.1, translated by Bernadotte Perrin, hereafter Plut., *Vit. Ant.*
[20] Sophocles *Philoctetes* 68, transl, by Sir R. Jebb; Plato, *Leges* 815a, translated by R.G. Bury.
[21] Homer *Iliad* 4.465, translated by S. Butler; hereafter Hom. *Il.*

archaeological investigation of the site and the associated Victory Monument which Octavian had erected shortly thereafter, suggest this dichotomy may not have held true across the entire battle. The arrangement and relative size of the displayed rams on the Actium Monument suggest Antony's large ships were restricted to the right side of the battle line, with more modestly sized "fours" and "fives" comprising much of his battle-line's center and left.[22] William Murray, instead, accounts for the relative immobility of Antony's fleet on the basis of accounts of the Roman's preceding summer campaign, which suggests the fleet was undermanned and weary.[23] The result however was the same, with Agrippa's vessels able to maintain a safe distance in the face of slow-moving opponents and make use of ranged harrying tactics and group attacks on isolated vessels.

" For since they dreaded the **long-range missiles** of the enemy no less than their fighting at close quarters, they wasted no time either in the approach or in the encounter, but running up suddenly so as to reach their object before the enemy's **archers** could get in their work…and then would retire out of range. The enemy, on the other hand, tried to hit the approaching ships with dense showers of **stones** and **arrows**, and to cast **iron grapnels** upon their assailants."[24]

Also in his coverage of Actium, Plutarch uses the term *pyrobólos*, or "fiery missile" to describe projectile volleys between the two sides.[25] While the lack of a specific missile type demonstrates the ambiguity of this term, it is most likely that Plutarch is denoting arrows as opposed to artillery projectiles, sling-bullets, or javelins.

Invariably linked to arrows, the bow (referred to as *biós* or *tóxon)* is treated in most texts as characteristic of Near Eastern rather than of European or Greek peoples. In Herodotus's

[22] Murray 2012, 237-38.
[23] Murray 2012, 241; Diod. Sic. 50.12.8, 50.14.4, 50.15.3,4; Plut. *Ant*. 64.1
[24] Cassius Dio, *Historiae Romane* 50.32.4-5., translated by Earnest Cary; hereafter Cass. Dio.
[25] Plut. *Vit. Ant.* 66.2

description of Xerxes's invasion force (7.61-80) and the various constituent nations within Xerxes's army, nearly all the troops are equipped with bows. Indeed, at the end of the Archaic period (ca. 480 B.C.E.) the bow was considered a defining feature of Oriental armies, and perceived by Greeks unfavorably due to the Persian Wars.[26] The Scythians and Parthians were the most renowned archers in the Near East,[27] and among the Greeks, only the Cretans had a reputation for proficiency with the weapon.[28] This skill meant they frequently served as their own corps in Greek armies, and later on among the auxiliary units of the Roman military.[29] Herodotus does not mention the use of arrows at Salamis, and Aeschylus only mentions their use at the amphibious assault at Psyttalea following the naval battle.[30] While we could assume such weapons were aboard the vessels due to this latter source, direct references to the use of arrows at naval battles only appear in later records when they are mentioned by authors like Plutarch.[31]

Polybius's *Histories* serves as the primary source for the Punic Wars between Carthage and Rome (264 – 146 B.C.E.). The first of these was characterized by a heavily naval component as the two military powers struggled for territory on the island of Sicily, which was located in a strategic position between their capitals and spheres of control. Interestingly, Polybius makes no mention of hand-held projectile weapons in the First Punic War's (264 – 241 B.C.E.) nine major naval battles, emphasizing instead ramming maneuvers and Rome's use of the *corvus* (raven), essentially a gangplank built onto the forward end of a galley to facilitate hand-to-hand boarding.

[26] Todd 2013
[27] Smith 1875, 126
[28] Xenophon, *Anabasis* 3.4.17, translated by C.L. Brownson; hereafter Xen. *An.*
[29] comp. Xen. *An*. 1.2.9; Livy, *History of Rome*/*Ab Urbe Condita* 42.35.7, translated by C. Roberts, hereafter Liv. AU*C*
[30] Aesch. *Pers*. 460
[31] Plut. *Vit. Them*. 14.3

However, he still appears to assume normal crew numbers for polyreme warships, meaning at least six archers could be expected per vessel.[32] Furthermore, it is known that the Romans and their contemporaries used such weapons due to the accounts describing the Battle of Actium. Therefore, the most reasonable assumption was that Polybius chose to omit details he took for granted, and focus on more novel or eye-catching aspects of naval combat such as coordinated ramming maneuvers and the newly invented *corvus*.

The use of arrows in naval battles can also be seen early on in the iconography of naval battles, namely in the sculptural relief depicting the Battle of the Nile Delta at Medinet Habu (Fig. 1.3), which shows the victory of the Egyptian Pharaoh Rameses III over an opposing fleet of the Sea Peoples (1175 B.C.E.).[33] Iconography from the Greek Geometric period shows several scenes including archers on warships, with 12 archers shown in naval contexts on pottery throughout this period.[34] Later, in Jason's Tomb – a first century B.C.E. rock-cut tomb in Israel – a charcoal drawing depicts an archer perched atop a forecastle of a war-galley shooting an arrow at a fleeing victim.[35]

[32] Valiani 2016, 20
[33] Wachsmann 1995
[34] Ahlberg 1971, 44
[35] Rahmani 1967, 71

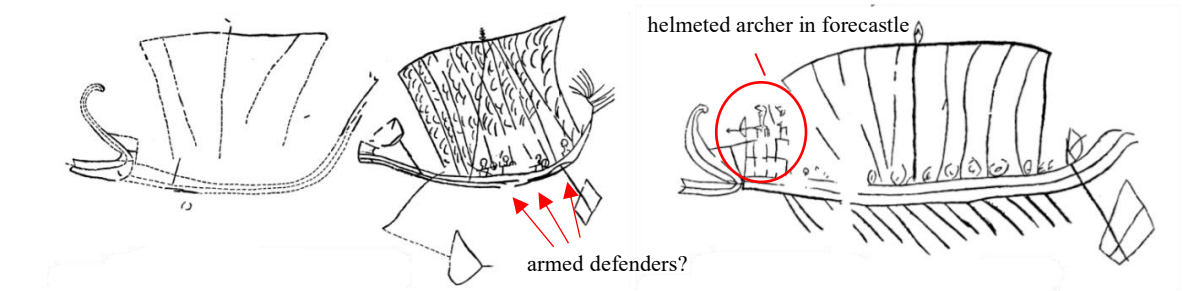


Figure 1.4: Pirate galley chasing two merchants, from Jason's Tomb (After Rahmani 1967, 71).

Slings

Contrary to what many may believe, bows cannot be claimed as the longest-range hand-held weapon in antiquity, and were often outdistanced by slings (sing. *sphendónē*; pl. *sphendónai*). Xenophon, in his history of the retreat from Persia of the Greek mercenary army called the Ten Thousand (401 B.C.E.), reports that the Greeks suffered heavy losses from the slingers in the Persian army under Artaxerxes II. The Greek mercenaries were unable to respond as they lacked cavalry and slingers (*sphendonḗtai*) and were unable to reach the enemy with their javelins and arrows. This disadvantage was overcome when a company of 200 Rhodians, who employed sling-bullets of lead, was formed. According to Xenophon, this unit could launch their missiles twice as far as the Persian slingers, who used large stones.[36] Most passages that mention the use of projectile weapons like arrows and javelins also mention slings. This is most frequently stated by denoting the projectile itself, using the term *líthos* (meaning 'stone') or *sphendonē*. Occasionally however, it is the slingers who are mentioned, as is the case at a battle near

[36] Xen. *An*. 3.3.17

Nineveh in which Xenophon's mercenary force participated.[37] From the mention of the projectile, one can assume the presence of the agent or personnel.

Almost without exception, when projectiles are mentioned at the commencement of battle, sling-bullets are included. Thucydides writing about Salamis (7.70.5), and Cassius Dio describing Actium (50.32) mention the use of *líthoi* (stones) as projectiles alongside arrows in the early stages of naval combat. The tragedian Aeschylus also reports that Greek naval troops employed stones during an amphibious assault at Psyttalea after Salamis, but uses the term *pétroi* or stones.[38] While lead sling-bullets are mentioned in other ancient sources, such as in Xenophon[39] and Virgil,[40] there appears to be no explicit mention them in naval contexts. Egyptian slingers are depicted on the Medinet Habu relief, perched atop ships' masts. Slingers are also shown on Trajan's column, albeit not in one of the naval scenes.[41] While slingers are known to have been a valuable strategic resource from sources like Xenophon, and records stating the effectiveness of Achaean and Balearic slingers used as mercenaries,[42] it is also known that they were numerically less common than members of other units due to the high-skill requirement needed for effective use of the weapon. Strabo notes of the Balearic slingers, that practice with a sling was a major part of their upbringing and "from childhood up, that they would not so much as give bread to their children unless they first hit it with the sling" (*Geography* 3.5.127). It is possible that the

[37] Xen. *An*. 3.4.17
[38] Aesch. *Pers*. 460
[39] Xen. *An*. 3.4.17
[40] Virgil, *The Aeneid* 9.75, translated by T.C. Williams; hereafter Virg. *Aen*.
[41] Coulston 2020, scenes LXVI, LXX, LXXII, CVIII, CXIII.
[42] Livy *AUC* 38.29.5

relative scarcity of their participation in terms of unit and troop numbers is reflected in the iconographic record, but this should not diminish their military importance.

Literary sources are especially important concerning slings and their projectiles as they are essentially invisible at most underwater sites. The cord and leather of the sling itself would have disintegrated completely under most conditions. Stone and lead projectiles, should they remain in significant numbers, are often indistinguishable under water from natural features or ballast. There is an issue of ambiguity in ancient texts, where authors simply write 'stones,' and it is often left up to the interpretation of the reader to infer their precise dimensions and how they were launched. Also, while lead projectiles are not mentioned at naval battles there would have been no reason to omit them from shipboard weapons, which raises the question as to whether *líthos* was used as a catch-all term for sling-bullets regardless of the material from which they were actually made.

Javelins

It is much more difficult to identify a predominant term for javelins in ancient Greek. While peltasts are mentioned with some frequency, this is a term for the class of warrior who wielded javelins rather than the weapon itself, and is derived from the crescent-shaped shield (*péltē/péltai*) with which they were often equipped. The majority of associated Greek terms identified in ancient texts are most accurately translated as describing on the one hand the accessories to or parts of a javelin, or on the other hand the action of using one. Similarly in Latin, the term *palta* refers specifically to the javelin shaft but is also used to denote the javelin

as a whole, in much the same way *dóru* is often used for spear.[43] Another Latin term, *amentum*, technically means the strap attached to the javelin which allowed its user to throw the projectile farther and more accurately.

When looking at discussions of naval battles at least, the most commonly used term in Greek appears to be *akóntion* (pl. *akóntia*), which appears to be a direct reference to javelins, or the term *akontistaí* for javelin-thrower, which is used by Herodotus in his discussion of the Battle of Salamis (8.90.2).

In the same passage where Plutarch writes about commadner Ariamenes shooting arrows at the Greeks at Salamis (*Vit. Them*. 14.3), he also uses the verb *akontízō,* to "hurl a javelin," commenting on how the admiral fired both projectile types "as though from a city wall" due to the size, and especially the height of his ship. This emphasizes the advantage provided by taller vessels in this form of naval engagement.[44] Similarly, Diodorus Siculus (20.51) uses the term *akóntisma* to denote the "distance thrown with javelin," or a javelin's effective range at the later Battle of Salamis in 306 B.C.E. between Ptolemy I and Demetrius Poliorcetes. Thucydides (7.70.5) notes the use of *akóntia* at the Battle of Syracuse in 413 B.C.E. as defensive measures against vessels closing in to ram them.

Marines were trained to throw javelins from a sitting or braced position at the moment of impact when ramming or being rammed.[45] This would have prevented them from being misguided and

[43] Snodgrass 1999, 109
[44] Plut. *Vit. Them*. 14.3
[45] Thuc. 7.67.2; Diod. Sic. 20.51.2

lost overboard due to the impact of ramming, thereby weakening the defending opposition or ward off immediate boarding attempts. In a unique instance insofar as we have textual evidence, at the Battle of Actium, combatants would "hurl with their hands torches fastened to javelins" among other incendiary projectiles, both by hand and with the assistance of *ballistae*/catapults in an attempt to set fire to enemy ships.[46]

Javelins are also one of the earliest weapons known in Greek naval combat as exemplified by painted pottery. Examples like the Kynos krater (Fig.1.2)(Late Helladic IIIC, c. 1190 – 1060 B.C.E.) from Lokris and a skyphos from a cemetery at Eleusis (Fig. 1.5)(eighth century B.C.E.) depict warriors equipped with crescents-shaped shields, javelins, and bows and arrows either stationed on or disembarking from war galleys.[47] As the ships closed on each other, troops on either side would have prepared for boarding and hand-to-hand combat. According to literary sources, combat would begin with grappling equipment designed to secure one ship to another and prevent their escape.

Figure 1.5: Naval battle scene on Eleusis skyphos (After Hurwit 2011, 7).

[46] Cass. Dio. 50.34
[47] Spathari 1995, 59

Long-Range Melee Weapons

Grappling Equipment

Metal grapnels, known individually as *cheír sidērâ,* or an *"iron hand"* were perhaps the most common form of grappling equipment. These are mentioned on several occasions, beginning with Thucydides, speaking about the Second Battle of Syracuse in 414 B.C.E.[48] Another mention comes from Diodorus Siculus, describing the Battle of Arginusae during the Peloponnesian Wars (406 B.C.E.).

"…[Callicratides] was the first to drive at the ship of Lysias the general, and shattering it at the first blow together with the triremes accompanying it, he sank it…[Lastly] he rammed the trireme of Pericles …Pericles threw an ***iron hand*** *on the ship of Callicratides, and when it was fastened tight, the Athenians, surrounding the ship, sprang upon it and…put [the enemy] to the sword…Callicratides, after fighting…finally was worn down by numbers, as he was struck from all directions."* (13.99.3–5)

At Actium, Antony's men are said to have repulsed their assailants with boat hooks.[49] As the fighting progressed, Octavian's men attempted in some cases to set their opponents' vessels ablaze. To accomplish this they "would make use of their **grappling-irons** (*chersí taís sidēraís*) and their **long spears** (*dórata taís makrós*) with the purpose of binding some hostile ship to theirs and crossing over to it, if possible, or, if not, of setting it on fire likewise."[50] Under the Romans, this weapon evolved into a ballistae-launched device called the *harpax*. This version of the weapon was first employed in 36 B.C.E. at the Battle of Naulochus during the Sicilian revolt.[51]

[48] Thuc. 7.62
[49] Cass. Dio. 50.33.7
[50] Cass. Dio. 50.34.7
[51] Appian, *Bella civilia* 5.12.118, translated by H. White.

While not quite a grappling tool, another weapon meant to immobilize an enemy ship was the "dolphin" (*delphís*), a heavy teardrop shaped weight which was thrown or dropped from a ship's yard with the intent of breaching the enemy's hull. Their use is mentioned by Thucydides (7.41) during the Peloponnesian War as Athenian merchantmen used them to dissuade Syracusan pursuers. Dolphins fell out of mainstream military use when they were effectively replaced by waterline rams on warships after the eighth and seventh centuries B.C.E. but continued to be carried by merchant vessels for centuries afterwards.[52]

Spears

In ancient Greek texts, there appear to be two common terms for the spear. The first is *aichmé*, and the other is *dóru*. The latter has been noted in several passages describing military action. A notable example can be found in Herodotus's coverage (7.89.3) of Xerxes' Achaemenid army composition, in which he states the Egyptian contingent had "spears for sea-warfare" *(dóratá te náumacha),* although he does not elaborate how these differed from a normal spear. In a naval context, *dórata te náumacha* could easily be used to describe boarding-pikes.[53] Boarding pikes, which were spears with a hook at the base of the spearhead for grabbing onto enemy ships, can be classified either as grappling weapons or spears but are grouped here with the latter, in addition to the obvious literary connection, on the grounds they more closely resemble spears than any of the grappling/boarding devices discussed previously. Herodotus (7.63.1) also states that the Assyrians had spears (*aichmás*) which, like their other equipment, resembled those of the

[52] Ciordia 2005, 4
[53] Hdt. 7.89.3

Egyptians. This suggests that boarding-pikes, perhaps in multiple variants, were included in the arsenals of various militaries.

Similarly, in the same segment of text where Cassius Dio recounts the use of grappling irons at Actium, he notes that "long spears" (*dórata*) were also used to pin down enemy vessels.[54] This use would imply that the weapons were also boarding pikes or a similarly designed version of spear, as a traditional spearhead would be ineffective for this purpose. A spear type which would have been more useful in this regard was the *xystón*, which is mainly known from descriptions of cavalry equipment.[55] It was a long thrusting spear, with a stop at the base of the blade to prevent it from plunging too deep into an enemy, getting stuck, and being lost to the rider using it. This design would have also suited soldiers in naval battles, as they sought to engage enemies on nearby ships without losing their weapon or being dragged overboard. While we have no explicit literary mentions of the *xystón* in naval contests, weapons closely matching its description can be seen in the frescoes at Akrotiri, Thera (c. 1650 – 1550 B.C.E.), both in the processual scene (Fig 1.6 A, in racks above rowers) and the battle scent (Fig 1.6 B and inset).[56]

[54] Cass. Dio. 50.34.7
[55] Xenophon *Cyropaedia* 4.5.58, 7.1.33, translated by W. Miller, hereafter Xen. *Cyr*.
[56] Prytulak 1982, 3-5

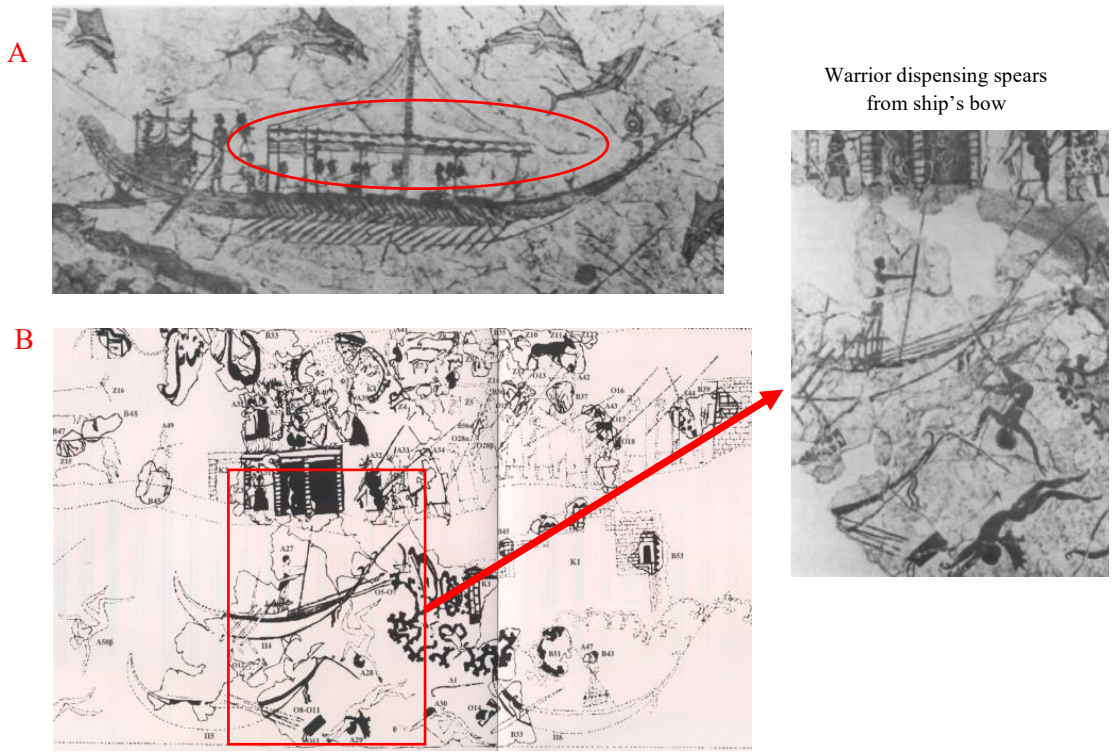


Figure 1.6: Thera fresco scenes showing *xyston* spears on storage racks (A) and during battle (B) (After Prytulak 1982 and Televantu 1994).

In Plutarch's account of Actium, he makes explicit note of the melee weapons used by Antony's and Octavian's naval troops as spears (*dórata*) and punting-poles/boat hooks (*kontoí*).[57] It is unclear whether he means that the latter weapons were used to attack enemy personnel or simply repel the vessels in a fashion like Cassius Dio reports.

Also at Actium, Eurycles the Laconian is said to have brandished a spear on the deck of Antony's warship as though he would throw it at the Roman commander.[58] Plutarch uses the term *lónchē*, which means "spearhead," "lance," or even "javelin." This plus the fact he is said to

[57] Plut. *Vit. Ant*. 66.2
[58] Plut. *Vit. Ant*. 67.2

be willing to throw the weapon, might suggest it was a shorter spear or one with a broken shaft, but this is purely speculation.

During the Battle of Salamis at Cyprus in 206 B.C.E., description of the hand-to-hand combat following ramming records that some soldiers in their boarding attempts "missed their footing, fell into the sea, and at once were killed with **spears** by those who stood above them."[59] Later on, Diodorus Siculus praises the fighting prowess of the Antigonid King Demetrius, claiming that he "fought most brilliantly of all…A crowd of men rushed upon him, but by hurling his **javelins** (*lónchē akontízō*) at some of them and by striking others at close range with his **spear**, he slew them."[60] This is a useful passage as it shows the terms for javelin and spear in close proximity to each other. The fact that the term *lónchē* appears in conjunction with *akontízō* ("hurl a javelin") to record the use of javelins could potentially inform interpretations of passages like that from Plutarch concerning Eurycles described earlier, and demonstrates that there is a degree of subjectivity present in this academic practice.

The technical distinction between the terms *aichmá* and *dóru,* is that the former denotes the spearhead/point while the latter is often used when an author wishes to emphasize the shaft of a spear.[61] This is generally just a particular way of referring to a spear as a whole (as in the famous sculpture the Doryphoros).[62] However, due to this functionality of the latter term there is also some potential for confusion when translating accounts of naval battles. This is because the term

[59] Diod. Sic. 20.51.4
[60] Diod. Sic. 20.52.1
[61] Hom. *Il.* 5.666.
[62] Hom. *Il.* 13.247.

is also applied to a tree or stem/branch, a usage which means the term extended to mean planks,[63] beams,[64] and even the mast and oars[65] in much the same way it was used to describe spear shafts.

Close-Combat Melee Weapons

Swords

The iconic ancient Egyptian sickle-sword, which is depicted on the Stele of the Vultures in Mesopotamia (2500 B.C.E.) and various depictions of pharaohs,[66] for example, had a curved sickle-shaped upper half to the blade. In the Coffin Texts of the First Intermediate period (c. 2181–2055 B.C.E.),[67] among other hieroglyphic writings, this sword is referred to as the *khopesh* (*ḫpš*). By the time of the Rosetta Stone (196 B.C.E.), it is used as the determinative for "sword" in hieroglyphic text, using the letters *kh*, *p*, and *sh* in a passage discussing the erection of a pair of statues.[68]

"Shall be set up a statue..., the Avenger of Baq-t-(Egypt), the interpretation whereof is 'Ptolemy, the strong one of Kam-t'-(Egypt), and a statue of the god of the city, giving to him a **sword** royal of victory, ..."[69]

Ancient Greek swords are very well documented. Subsequently, when it comes to mention of swords in ancient Greek texts, a wealth and variety of information is available. Different styles

[63] Hom. *Il.* 15.410.
[64] Hom. *Il.* 24.450.
[65] *Hymn. Is.* 152 in *Anthologiae Graecae Appendix, Epigrammata exhortatoria et supplicatoria.*
[66] Loades 2010, 1-21.
[67] Faulkner 1973.
[68] Budge 1929, 155-56.
[69] Rosetta Stone, *Line 6,* translated by E.A.W. Budge.

of swords had different names and, as with the previously discussed terms most have multiple meanings depending on their use and context so there are multiple options when identifying a sword based on text alone.

The *hárpē* was a type of sword or sickle; a sword with a sickle protrusion along one edge near the tip of the blade. The *hárpē* is mentioned in Greek and Roman sources, and almost always in mythological contexts.[70] A *kopís* was a curved one-handed weapon, identified as a short sword or heavy dagger with a blade 48 – 65 cm in length,[71] and it was often used by foreign soldiers. The *akinákēs* was a short, straight sword of Persian or Scythian origin designed for thrusting in close quarters. Like many swords in the ancient Mediterranean, the *akinákēs* also bordered on being a dagger, with actual examples ranging in length from 40 – 60 cm.[72] The *akinákēs* is shown in artwork, including a relief of a Median guard from Persepolis, and a red-figure vase painting (340 – 320 B.C.E.) depicting King Darius I sitting on a throne with the sword in his lap.[73]

A somewhat less common word for sword was *phásganon/phásgana*.[74] The Linear B term "pa-ka-na" could be an early form of *phásganon*, a word commonly used by Homer for 'sword'.[75] There is ambiguity in the term's Homeric application however, as it might have been used exclusively for daggers and stabbing weapons.[76] Like the *akinákēs*, it was a straight double-

[70] Achilles Tatius, *Leucippe and Clitophon* 3.7.8-9, translated by S. Gaselee.
[71] Tarassuk and Blair, 1982.
[72] Tarassuk and Blair, 1982.
[73] Harrison 2009, 109.
[74] Snodgrass 1999, 22.
[75] Hom. *Odyssey* 22.91, translated by S. Butler, hereafter Hom. *Od.*
[76] Snodgrass 1999, 22.

edged weapon. It can be tentatively linked to the Greek verb *sphazō*, meaning "to slay, to kill," but this could be coincidental.[77] It does not appear to have been used to refer to swords after c. 400 B.C.E.[78]

The *xíphos* is the sword from ancient Greece with the most enduring archaeological and literary evidence. In depictions these swords have double-edged leaf-shaped blades, as shown on a red-figure vase painting from Metaponto depicting Actaeon fighting off his enraged hounds (390 – 380 B.C.E.). An early form of *xíphos* is attested in Mycenaean Greek Linear B, the oldest known form of Greek writing, as qi-si-pe-e.[79] Qi-si-pe-e has been translated as the dual figure nominative case form of "qi-si-po," the singular form.[80] Therefore, the exact meaning of qi-si-pe-e would be "two swords.[81] In later Greek texts, the term is used by Homer synonymously with *phásganon* mentioned above. So, what we have are two different terms for sword within the same literary tradition that may represent multiple weapon variants, which over time disappeared or merged into a single weapon. In the *Odyssey*, Homer uses the term *xíphos* in a quasi-maritime context as Odysseus and his crew perform a sacrifice to the dead:

"Thither we came and beached our ship, and took out the sheep, and ourselves went beside the stream of Oceanus…I drew my sharp **sword** (*xíphos*) from beside my thigh, and dug a pit of a cubit's length this way and that, and around it poured a libation to all the dead." (11.48)

The passage implies Odysseus and his crew were equipped with *xíphoi* while on their voyage, and therefore likely had them during the Trojan War as well. In a similarly tangential passage

[77] Hdt.5.25, 7.107; Beekes and van Beek 2010.
[78] *The Online Liddell-Scott-Jones Greek-English Lexicon (*www.tlg.uci.edu/lsj*)*, s.v. "φάσγανον"; hereafter *LSJ Online.*
[79] [PY Ta 716 tablet] in Huebeck 1958, 114.
[80] *The Linear B word qi-si-pe-e.* Palaeolexicon Online, accessed 5 August 2020.
[81] Heubeck 1958, 114-16.

Plutarch, following his description of Antony's fleet preparations for Actium, recounts an infantry centurion who bemoans the course of action. The soldier beseeches his commander:

"[2] Imperator, why dost thou distrust these wounds and this **sword** (*xíphos*) and put thy hopes in miserable logs of wood? Let Egyptians and Phoenicians do their fighting at sea, but give us land, on which we are accustomed to stand and either conquer our enemies or die."[82]

Interestingly, explicit mentions of swords at ancient naval battles are sparse relative to all other forms of hand-held weapons (barring side-arms like knives). Presumably, their limited range made them less useful than options like javelins and spears, especially if the aim was to reach the opponent before they successfully boarded one's vessel, or if there was a height disparity between ships. Swords might have been a last-resort option should other attempts to kill the opponent fail. Regardless, we know they must have been present on warships, at least in some circumstances.

Thucydides points out that during the Peloponnesian Wars, Peloponnesian *epibátai* (marines) were selected for their hoplite arms and equipment (7.1.5), while the Athenians 'forced' hoplites to serve as such in their fleets. This pattern of employing terrestrial troops in naval contexts continued with the Romans. During the First Punic War, the *corvus* was allegedly very effective because it allowed Roman forces to apply their terrestrial combat methods to naval battles.[83] In both these cases, it is known from other sources that the standard equipment for both Classical Greek and Republican Roman (Manipular Roman Army) infantry included swords. Hoplites

[82] Plut. *Vit. Ant*. 64.2.
[83] Goldsworthy 2004.

were known to typically possess either a *xíphos* or *kopís* as sidearm in addition to their long spears.[84] Roman manipular infantry carried swords (*gladii*) for use when their spears and *pila* (javelins) were expended.[85] Therefore, if these troops were employed as marines specifically for the equipment they brought with them, it stands to reason that they would bring their swords on board.

In later contexts, the term *xíphos* is used to denote that an individual or entity holds the "power of life and death" over another.[86] In Latin, the term for this is *jus gladii.*[87] This shows an interesting parallel between Greek and Roman literature, as the *gladius* was the most iconic sword in Rome's military arsenal, and the word was also used to denote swords in general. The word first appears in literature in the plays of Plautus,[88] who lived in late third-early second centuries B.C.E. Reinforcing this parallel between the two is the theory that the design of the *gladius* as a weapon was itself derived from the Greek *xíphos*.[89]

The Iberians of the Punic War era (241–167 B.C.E.) were well-known for the design and manufacture of high-quality weapons, most conspicuously the *gladius hispaniensis* which was adopted as the standard close-quarters weapon of Roman soldiers. It held this status until the third century C.E. Although Polybius claims that the *gladius* was adopted by the Romans during the Second Punic War (218–201 B.C.E.), he possibly contradicts himself – depending on

[84] Kagan and Viggiano, 2013.
[85] Bishop and Coulston, 2006.
[86] Philostratus *Vita Apollonii* 4.42, translated by F.C. Conybeare, hereafter Philostr. *VA.*
[87] Philostr. *VA* 4.42.
[88] *Casina* and *Rudens.*
[89] Quesada Sanz 1997.

interpretation –by implying that it was already in use by 225 B.C.E. during the Gallic invasion of Etruria.[90]

Other sword variants employed by the Romans include the *falcata*, which they adopted from Iberia, and the *sica*, a short sword from the Balkans. As the Roman Republic, and later Empire, expanded and added an ever-increasing variety of foreign auxiliaries into their armed forces, so too did the diversity of their weaponry increase. However, up to the beginning of the Common Era, none is explicitly documented as being present at naval engagements. The closest that can be found are the mentions by two Roman authors, Plutarch (C.E. 46–119) and Lucan (C.E. 39–65). Plutarch, in his *Life of Julius Caesar*,[91] while detailing feats of individual bravery from the Roman civil war, covers a number of battles in quick succession. Two of these battles are naval in nature. In the first referenced naval battle, at Massalia between Decimus Brutus and a Hellenic fleet in 49 B.C.E., a Roman named Acilius has his right hand cut off by a sword while boarding an enemy ship.[92] In the second, Caesar's follower Granius Petro is captured at sea by Scipio. When offered leniency by his captor, Granius instead elected to kill himself with his own sword.[93] It is unclear, however, if his suicide occurred immediately following capture at sea or later on land. Lucan's *De Bello Civili*, includes a poetic account of the same naval engagement at Massalia also discussed by Plutarch, but in significantly more detail.

The foe they grapple, by entangled oars
Themselves held back. And now no outstretched arm
Hurls forth the **javelin**, but **sword** in hand
They wage a naval fight: each from his ship

[90] Quesada Sanz 1997, 267; Polyb. 2.33; Hom. *Il.* 30, 35.
[91] Plutarch, *Vitae Parallelae Caesar* 16.2-8, translated by B. Perrin, hereafter Plut. *Vit. Caes.*
[92] Plut. *Vit. Caes*. 16.2.
[93] Plut. *Vit. Caes*. 16.8, it is unclear whether the execution occurred at sea or later on land.

Leans forward to the stroke, and falls when slain
Upon a foeman's deck. Deep flows the stream
Of purple slaughter to the foamy main[94]

Lucan

Knives

There were a fair number of commonly attested knife types in the ancient world. Furthermore, as many ancient Greek and Roman swords were quite short, the line between knife and sword is not clearly defined. Terms such as *máchaira* could be applied to a large knife,[95] short sword,[96] or saber.[97]

There is also the term *kopís*.[98] As has been previously mentioned, the *kopís* can sometimes denote a knife. It is interpreted as being used in this fashion by Euripides[99] to describe a wide-bladed curved knife used by Thessalians, and by 'Orientals' in Xenophon's *Cyropaedia* (2.1.9, 6.2.10). The term *kopís* (pl. *kopídes*) comes from the verb *kóptō*, meaning "to cut, to strike." Due to the similarity in terms, and the fact both had single-edged curved blades, a connection to the Egyptian *khopesh* has been hypothesized.[100] Xenophon distinguishes between a *xíphos* and a *kopís*, but conflates the latter with a *máchaira*. Discussing what weapon, he endorses for use by cavalrymen, the ancient general writes:

[94] Lucan, *De Bello Civili* 3.609-17.
[95] Hom. *Il.* 11.844, 18.597, 19.252.
[96] Hdt. 6.75, 7.225; Aristophanes, *Lysistrata* 13.87, translated by J. Lindsay.
[97] Xen. *Cyr.*1.2.13; Snodgrass 1999, 97.
[98] Snodgrass 1999, 97.
[99] *Electra* 837.
[100] Gordon 1958.

"I recommend a *kopís* rather than a *xíphos*, because from the height of a horse's back the cut of a *machaira* will serve you better than the thrust of a *xíphos*."[101]

This, in addition to the root of the word meaning "to cut," has been used to suggest that the *kopís* was a specific subtype within a general classification of single-edged bladed weapons known as *máchaira*. Xenophon also discusses a Spartan dagger called a *xuēlé,*[102] but there are no depictions or extant examples solidly identifiable as this dagger type. The resulting ambiguity has led to the suggestion that the term might refer instead to a drawknife.[103]

Knowing the infrequency of references to swords in naval battles, it is unsurprising that mentions of knives are equally – if not more – scarce. With the same reasoning, one can assume that the *kópis* was present at naval battles due to its being standard armament for *hoplítai/epibátai*, and the same inference may be for the made for other weapons with similar blades. Modern distinctions of these weapons as swords or knives are irrelevant to how they would have been used by ancient militaries.

The most commonly attested Roman knife both in literature and archaeology is the *pugio*, which is a well-known sidearm of Roman troops. Another, the triangular-bladed *parazonium,* is less common but appears in Roman iconography and mythology.

[101] *On Horsemanship* 12.11.
[102] Xen. *An*. 4.7.16, 4.8.25
[103] Sekunda 2001

Axes

As with bladed weapons, there were many forms of axe in the ancient world, as they fulfilled various functions. In ancient Greece, *pélekus* was a recurring term used for a two-headed axe. Frequently this was a battle-axe. However, it could also refer to a sacrificial,[104] executioner's,[105] or woodcutter's axe.[106]

A *lábrys* was a very ancient form of double-headed axe from Crete. Plutarch links the term to the Lydian word for double-bitted axe. The word probably appears in Linear B inscriptions, and it may be of Minoan origin. Herodotus also mentions the *ságaris*, a war-axe of Near Eastern origin and used by Western and Central Asian societies.[107] Herodotus attributes its origins and usage primarily to the Sacae (Scythians) during his documentation of Xerxes' army.[108] A Scythian archer is shown holding such an axe on a sixth century B.C.E. red-figure Attic amphora,[109] suggesting it was likely a side weapon.

The military function of the *pélekus* is attested during an account in which Spartans justify their desire for independence in the face of a Persian inquir, and state "You know well how to be a slave, but you, who have never tasted freedom, do not know whether it is sweet or not. Were you to taste of it, not with spears you would counsel us to fight for it, no, but with axes (*pélekus*)".[110]

[104] Hom. *Il*.17.520, *Od*.3.442.
[105] *Tragica Adespota*, in *Tragicorum Graecorum Fragmenta,* 412, translated by A. Nauck.
[106] Hom. *Od*. 5.234.
[107] Snodgrass 1999, 85.
[108] Hdt. 7.64.
[109] Ivantchik 2006, 211.
[110] Hdt. 7.35.1

In the *Iliad*, Homer also makes clear the martial capabilities of battle-axes (*pelékessi*) and hatchets (*axínai*) when the Trojans attack the Greek beach encampment, noting their use as the two sides battle "beside the ships."[111] The distinction of the two within the same sentence is analytically useful in interpretation and developing typologies. At Actium (31 B.C.E.), Cassius Dio (50.33.7) claims Antony's men used axes to destroy boarding devices and repel their assailants). His use of the term *axínai* would suggest these more closely resembled hatchets than double-sided battle axes.

Armor

Cuirasses

An entire suit of armor was called in Greek a *panoplía,* or *"*panoply*"* in English (Hdt. 4.180.3). However, the lack of this term's usage in naval contexts warrants references to armor be broken down into their individual components. *Thṓrax* is the root term used to describe torso armor, identified as 'cuirass' or 'corslet' when translated. However, the word is liberally used by the Greeks for many types of armor, which has led to some difficulties in interpretation.

For example, *linothṓrax* denotes a breastplate made of linen fabric, *thṓrax chrýseos lepidōtoí*[112] is used to describe a coat of scale, and *thṓrax (chrýseos) álysidōtós* denotes chain mail armor (used by Celts and Romans).[113] The meaning of *thṓrax* also extends to chest bandaging so again

[111] Hom. *Il.* 15.696
[112] Hdt. 9.22.
[113] Polyb. 6.23.15.

there is possible confusion when identifying the term in ancient sources.[114] Paul McDonnell-Staff, in analyzing Xenophon's use of the term *thṓrax* suggests that, when the term is unmodified by a pre/suffix like *lineon* in military contexts, it can be associated with a bronze cuirass.[115] For example, following an unsuccessful campaign against Persia, Xenophon returns to Greece with a group of mounted mercenaries. When on foot, he finds himself heavily burdened by his cavalry *thṓrax*,[116] which suggests that it was probably made of weighty metal. As was the case with swords, the fact that 'hoplite' equipment was an important criterion in selecting *epibátai*, it is likely that at least some of them wore bronze armor during naval battles. Aeschylus describes Greek soldiers as wearing bronze equipment when disembarking at Psyttalea after the battle of Salamis: "fencing their bodies in armour of bronze, they leapt from their ships".[117] Additionally, Herodotus writes that the Lycians in Xerxes' navy "…wore cuirasses and greaves"[118] while "The Cilicians…wore…woolen tunics."[119] However, as these quotes suggest, this equipment was not universal. An alternative form of armor to the bronze cuirass/corselet was the *linothṓrax*, or *thṓrax lineoi*, a corselet made primarily of layered linen. The linen fabric was reinforced by a metal sheet encircling the abdomen over a strip of leather or felt cloth called a *zôma*.[120] Metal plates or flaps called *pteryges* protected portions of the upper torso.[121] Strabo claims the Lusitanians were known for their swift light-infantry and ambush tactics, with their soldiers

[114] Heliodos, in Oribasius, *Collectiones medicae* 48.48; Soranus, *De fasciis,* 33.
[115] Bardunias 2018.
[116] Xen. *An*. 3.4.48.
[117] Aesch. *Pers*. 456-7.
[118] Hdt. 7.92.
[119] Hdt 7.91.
[120] Hom. *Il.* 23.683, 4.216, *Od.* 14.482
[121] Xen. *An.* 4.7.15.

wearing "*linothṓrakes…[kaí]…dé álysidōtós*" or linen corselets and chain coats.[122] Such light armor would suit naval combatants, by reducing the risk of drowning if thrown overboard.

The *linothṓrax* was a popular form of armor, and its use by the Greeks is mentioned repeatedly by sources such as Herodotus,[123] Livy,[124] and Strabo,[125] among others. Furthermore, when Alexander received 25,000 new suits of armor for his army while on campaign in India, he is alleged to have ordered the old damaged suits of armor to be burned.[126] This would only make sense if they had been made of a flammable fabric, a strong indication they were *linothṓrakes*. The *linothṓrax* is also depicted on number of Greek red-figure ceramics, such as a *kylix* by the Sosias Painter (500 B.C.E.) and a *calyx krater* attributed to the Syleus Painter (c. 460 – 450 B.C.E.). Only the Praeneste Relief (Fig. 1.7), believed to show a ship from the Battle of Actium, presents clear iconographic evidence for a bronze cuirass in naval combat.[127] One of two soldiers in the foreground of the scene, standing on the vessel's outrigger platform, wears a cuirass with pronounced musculature. This surely indicates it was made of metal. However, another soldier on deck behind him wears what appears to be a *linothṓrax*, and cloaks obscure the equipment of the other soldiers, revealing that even within the context of this image the metal cuirass is an irregularity.

[122] Strabo, *Geography*, 3.3.6. translated by H.C. Hamilton and W. Falconer, hereafter Strab.
[123] 2.182, 3.47, 7.63
[124] 4.19.2–20.7
[125] 3.3.6, 13.1.10
[126] Aldrete, Bartell, and Aldrete 2013.
[127] Erdkamp 2007.

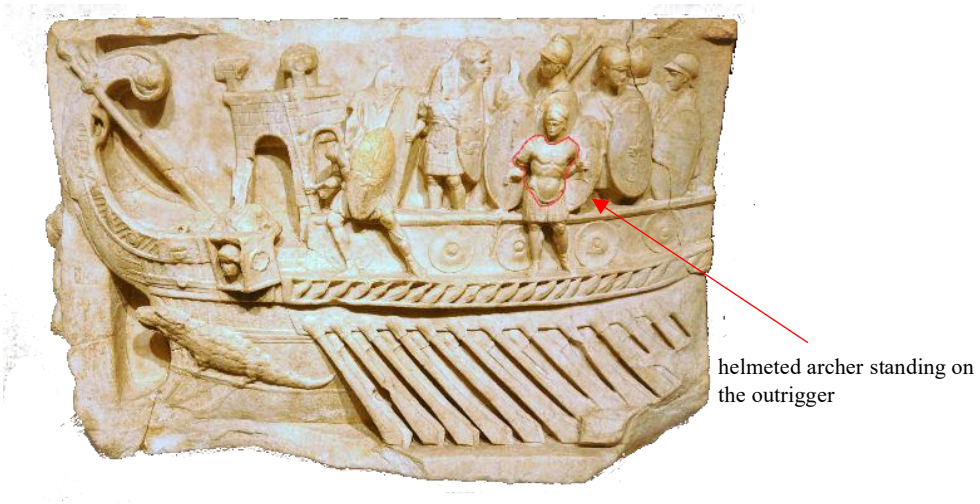


Figure 1.7: The Praeneste relief (After J. Lendering/livius.org).

Direct references to specific armor pieces at naval battles are exceedingly rare. More common is a general reference to "armor" as a whole, without specifying its components. For example, at Salamis (306 B.C.E.), when under attack from the ranged weapons of a boarding party, Demetrius "…received [missiles]…upon his defensive armor (*skepastēríos hóplon*)."[128] Diodorus uses the term *hóplon* to describe armor here, presumably in its capacity to identify the equipment of hoplites. However, its use does not clearly denote any particular piece of armor. One can conclude that it also possibly refers to a shield. As will be discussed below, *hóplon* is a term sometime associated with shield. This interpretation, however, is weakened by other passages discussed in the section on "Additional Equipment" (pp. 38–42).

Similarly, at Actium, combatants are reported as being

"…consumed in their **armour** (*hóplon*) when it became heated. There were still others, who, before they should suffer such a death, or when they were half-burned, threw off their **armour** (*hópla*) and were wounded by the shots which came from a distance, or again leaped into the sea

[128] Dio. Sic. 20.52.

and were drowned, or were struck by their opponents and sank, or were mangled by sea-monsters."[129]

It is unlikely that Cassius Dio would be talking about shields here, as he also used terms like "roast…like an oven" elsewhere to describe the overheating of the soldiers. Shields would not result in such overheating but bronze breastplates – and conceivably also helmets – would. Unfortunately, all of this is based on inference rather than explicitly stated information.

One might expect Greek authors to provide the most information on armor types with which they were most familiar; however, this is not the case. Some Ionian Greeks were included in Xerxes' army. Contrary to expectations, Herodotus provides some of the least informative descriptions on these contingents. As previously noted, when discussing contingents like the Ionians and Dorians, he simply states that their armor "was Greek".[130] Similarly, after remarking that the Carians of Asia Minor used scimitars and daggers, Herodotus states that they had "for the rest Greek equipment."[131] Similar statements are made concerning the equipment of the Pamphylians and Cyprians. Herodotus's reliance on his readership's familiarity with Greek material culture here deprives modern scholars of several potential sources of information on ancient Greek armament.

A variant of *thṓrax* is used in a naval context, namely *thṓrákion*,[132] but it does not describe personal armor at all. Instead, it denotes a defensive emplacement. These were usually on walls

[129] Cass. Dio. 50.35.2-3.
[130] Hdt. 7-93-94.
[131] Hdt. 7.93.1.
[132] Hdt.1.181; Diod. Sic. 17.44.

that provided protection up to chest level like parapets. Here, however, the term was here applied to the crow's nest atop a ship's mast from which javelin throwers launched their missiles.[133]

The Romans break down their armor variants in a much more distinct and systematic fashion, with *lorica* serving as the core Latin term for cuirass. *Lorica musculata* refers to the frequently depicted muscle cuirass, usually of bronze. *Lorica squamata* was scale chest armor, and *lorica hamata* was chain mail. A *pectorale* was not a full torso armor, but a square metal chestplate worn over a tunic.[134]

Helmets

There is some ambiguity in ancient Greek terminology when it comes to headgear. For example, *pîlos* could refer to a conical hat or a helmet of similar shape which became popular during the Hellenistic period.[135] The precise form of the Persian *tiára,* a headdress which was worn by the Persian Immortals and other infantrymen,[136] is unconfirmed but some sources describe it as a cloth or felt cap which could be drawn over the face to protect against harsh winds and dust in the arid Persian climate.[137]

[133] Athenaeus, *Deipnosophistae*, 11.475a., translated by C.D. Yonge., hereafter Ath.
[134] Snodgrass 1999, 63.
[135] Snodgrass 1999, 94.
[136] Snodgrass 1999, 101.
[137] Lendering 1997.

Herodotus names a great variety of headdress in the Persian army of the fifth century B.C.E. They are described in varying levels of detail. In the case of the Cissians, whose attire was similar to that of the Persians, "but…wore turbans instead of caps."[138] For the Sacae (Scythians), only their headwear is described as they allegedly "…had on their heads tall caps, erect and stiff and tapering to a point."[139]

However, the most relevant term appears to be *krános,* as it seams to apply commonly and almost exclusively to metal helmets in a number of ancient Greek and early Roman sources. Abradatas, King of Susa, is said to have a *krános* made of gold.[140] During the Roman siege of Athens (87–86 B.C.E.), Marcus Ateius shattered his sword by hitting it on an enemy's *krános*,[141] an impossibility if the helmet was not of metal. Furthermore, it is mentioned in conjunction with other armor. Herodotus credits the Carians with innovations in military equipment like being the first to put crests on helmets (*kránē*) as well as mounting grips on shields and emblazoning them with devices (Hdt. 1.171). Also from Herodotus, we have an account of an annual festival celebrating the goddess Athena at Lake Tritonis in Libya, in which a maiden is dressed in armor and a "Corinthian helmet" (Hdt. 4.180.3).

This last passage is significant as, while it uses an alternative term for helmet that can also translate as "cap" (*kynéi*), it is a rare example of a literary reference where an actual typology is provided. That being said, Herodotus makes other mentions that note a defining or unusual

[138] Hdt. 7.62.
[139] Hdt. 7.64.2.
[140] X. *Cyr*. 6.1.51.
[141] Plutarch, *Vitae Parallelae Sull*a, 14.2.

aspect of a helmet. He describes Assyrian helmets as being made of "twisted bronze made in an outlandish fashion not easy to describe", which provides a hint of their appearance but clearly not a holistic description.[142] Likewise, Aeschylus describes Tydeus' helmet as having "…three overshadowing plumes, his helmet's mane."[143]

Herodotus discusses helmets briefly in his description of the Persian navy as well. He cites Phoenicians and Syrians as wearing helmets (*kranē*) similar to those of the Greeks, also using the term to describe the "woven helmets" of the Egyptians, demonstrating a broad usage of the term to describe headgear beyond metal helmets.[144] However, direct literary mentions to helmets at naval battles are non-existent. As with shields, we must infer from indirect mentions of *epibátai*, hoplites, and Roman troops during the Punic Wars that they wore helmets as part of their standard equipment. Additionally, tangential references like that concerning Demetrius' "defensive armor", [145] can be interpreted as evidence for the presence of equipment such as helmets at naval battles. However, more specific conclusions become somewhat speculative. Our typological inferences on what style of helmets were used can only be inferred by our understanding of prevailing styles and contemporary archaeological finds. In fact, the only time the term *krános* is used in a direct naval context, it is used to describe a ship's ram.[146]

[142] Hdt. 7.64.
[143] Aeschylus *Sept.* 376, translated by H. Wier Smith.
[144] Hdt. 7.89.
[145] Diod. Sic. 20.52.1.
[146] Timotheus, *Persae,* 21, translated by J.M. Edmonds.

The Latin term for a military helmet is *galea. Galea* as a term, like *krános* before it, demonstrates one of the main issues with literary sources in that – without additional information about context – they cannot provide many details about their physical appearance. Depending on the era of use, the term *galea* could refer to a Montefortino, Coolus, Gallica, Italic, or Ridge type helmet, all of which were used by Roman legionnaires in significant numbers and are typologically distinct.

Additional Equipment (Shield & Greaves)

Other than torso armor and helmets, the only other noteworthy protective equipment carried by ancient troops were shields and greaves. Like peltasts, the hoplite class of warrior was defined by its shield. The term hoplite is derived from their shield, which is frequently referred to using the term *hóplon*, but another common term is *aspís* (pl. *aspídes*). An *aspís* was a large concave dish 80–100 cm in diameter. *Aspídes* were made mostly of wood, with a sheet of bronze covering their exterior face.[147] The interior concave surface was covered in leather with a grip of the same material. It is considered a hoplite's most important piece of equipment[148] due to its vital role in infantry formations of the period. Sadly, due in part to the perishable materials used in constructing shields, only one *hóplon* has been preserved well enough for researchers to analyze its composition and construction.[149] The so-called "Vatican" shield, therefore, represents the only

[147] Bardunias and Ray Jr. 2016, 30-33.
[148] Sage 1996, 281.
[149] Travis and Travis 2014, 33.

extant archaeological example for reconstructive purposes of shields,[150] with all other sources being only epigraphical in nature.

While *hóplon* in military contexts is translated as a hoplite's shield,[151] its literal meaning is simply "tool" or "implement".[152] In maritime contexts it is also used to denote ropes and tackle on ships.[153] As has been shown earlier in the "Cuirass" section, *hóplon* could also refer to armor in general. *Aspís* appears to be more specific in its application to shields, but also more flexible in that it can refer to multiple types of shield. It is by far the most common term used by ancient authors to refer to shields at sea.[154] In naval contexts, shields are mentioned both for use in combat and as signaling devices, usually in the early phases of an engagement

During the Peloponnesian War, the Spartan commander Lysander instructed a scout ship to raise a shield (*aspís*) to indicate when the Athenian fleet was scattered and vulnerable to attack.[155] At Salamis (306 B.C.E.), as the two fleets prepared for battle, Demetrius is said to have used a "gilded shield" (*aspís chrysóō*) to instruct his fleet to advance upon the enemy, with the message relayed in similar fashion. Ptolemy, in response, used a "similar signal" and the two sides closed in on each other to commence battle.[156]

[150] barring the Vergina Tomb shield, which is decorative and whose construction is likely not representative of shields meant for practical use.
[151] *LSJ Online*, s.v. "ὅπλον"; Th.7.75.
[152] *LSJ Online*, s.v. "ὅπλον"
[153] Hesiod. *Opera et Dies*. 627, translated by H.G. Evelyn-White; Hom. *Od.*2.430; Hdt.7.25.
[154] LSJ Online, s.v. "ἀσπίς"
[155] Xenophon, *Hellenica*. 2.1, translated by C.L. Brownson, hereafter Xen. *Hell.*
[156] Diod. Sic. 20.51.1.

In combat, the function of a shield is obvious. When Demetrius finds himself in danger during combat, three of his men are described as "protecting him with their shields" (*hyperaspizóntōn*).[157] At Massalia in 49 B.C.E., after Acilius loses his right hand to an enemy's sword, he uses the shield in his left as an offensive weapon, "dashing it into the faces of his foes."[158] However, due to the variety of armies and troop types, there are several types of shields we know to be in use. The Egyptians in Xerxes' fleet were said to use round, hollow shields with broad rims (*aspídes dè koîlos*),[159] a description that resembles what is known about hoplite shields. The Phoenicians on the other hand, had shields without rims (*aspídes dè ítys ou échō*).[160] The Cilicians in the fleet used "buckler" shields (*aspídōn*) of ox-hide.[161] The broad use of *aspis* presents both benefits and complications. While one can be confident its use identifies shields in military contexts, without additional description the specific type of shield used cannot be determined. Occasionally other terms for shield are used, as at Actium, where Octavian's and Marc Anthony's crews are reported to have employed wicker shields (*gérra;* sing. *gérron*) and spears in hand-to-hand combat.[162] *Gérron* simply means anything made of "wickerwork", but in these contexts 'shield' makes the most sense.[163] The only strong evidence for the use of hoplite shields specifically comes from the Aristonothos krater (Fig. 1.8), a seventh century B.C.E. ceramic found in the Cerveteri district of Rome.[164] On its exterior is depicted a scene with two galleys facing each other. One is of Greek design while the other is foreign – possibly

[157] Diod. Sic. 20.52.2.
[158] Plutarch *Vit. Caes.* 16.2.
[159] Hdt. 7.89.3.
[160] Hdt. 7.89.1.
[161] Hdt. 7.91.1.
[162] Plut. *Vit Ant*. 66.2.
[163] Hdt. 7.61; X. *Cyr*. 7.1.33.
[164] Dougherty 2003, 35.

Etruscan[165] – but the warriors on both galleys are equipped with large, circular, emblazoned shields easily interpretable as hoplite shields. On ancient coinage, a line of dots sometimes appears along a galley's bulwark that is usually identified as row of shields.[166] However, given the small scale there are essentially no details that allow for their identification as specifically hoplite shields. Often, it is difficult to discern if the shields were intended to be shown as fixed to the ship's bulwark or held by warriors. Regardless, in no numismatic cases are shields shown as actively used in combat.

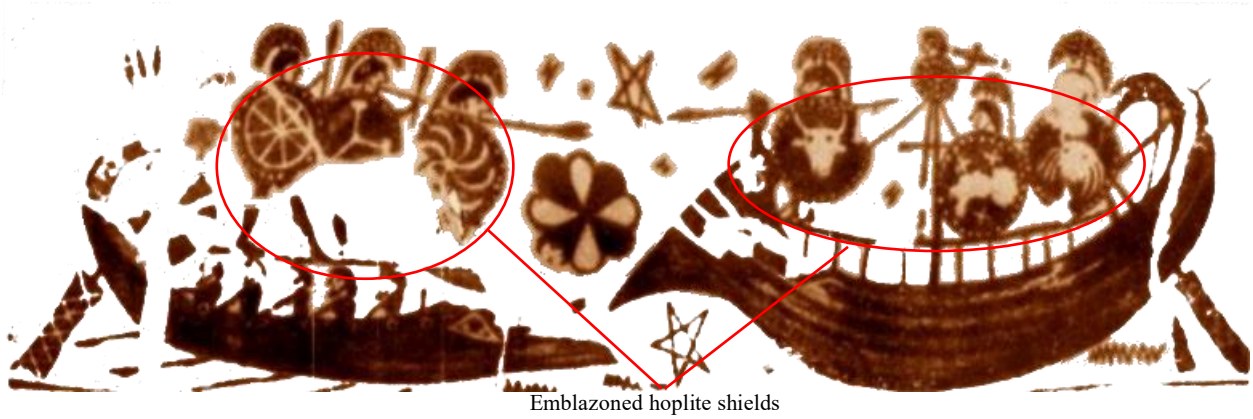


Figure 1.8: Naval scene from the Aristonothos krater (After Dougherty 2003).

The last noteworthy piece of armor, and the least commonly mentioned, are greaves (*knēmís*). These were armor that protected the lower leg from injury, and were typically made of metal. Herodotus relates the only explicit record of greaves in relation to naval personnel. The Lycians of the Achaemenid fleet wore both cuirasses and greaves.[167] The latter's mention in conjunction with the former, which was likely bronze (see Cuirass section), without further elaboration suggests they were also made of metal. It is possible that those parties (Pamphylians, Dorians,

[165] Dougherty 2003, 37.
[166] Frost et al. 1981, 260.
[167] Hdt. 7.92.1.

Aeolians, Pontians) described as being equipped "like Greeks" wore greaves, but this is difficult to confirm without more specific information about what Herodotus intended by this phrase.

An example of what might be considered a full Hellenic panoply was found in 1977 at the Macedonian royal tombs in present-day Vergina, Greece. This preserved set of armor has been attributed to King Phillip II of Macedon himself,[168] and includes a helmet, cuirass, shield, greaves, *ptéruges*,[169] and sword. The cuirass and helmet are made primarily of iron with gold gilding. The shield on the other hand was ornately made of wood, ivory, glass, and gold.[170] Several spears and *sarisa* (long Macedonian pike) butts and points were found in the main tomb chamber as well.[171] While the quality of craftmanship and gilding material of this ceremonial equipment would be more than what one would expect for standard military equipment, the same constituent armaments would likely have been shared with fully equipped hoplites.

Herodotus rarely describes an entire set of armor for any of the nationality in his Persian army and navy lists. Instead, he writes about what he considers distinctive, be that a helmet, shield, weapon, other garment, or combination thereof.[172] Subsequently, if we consider greaves distinctive for Lycians in the fleet, it may imply that they were rare elsewhere. It is not entirely surprising that greaves are rarely mentioned at naval battles. Metal greaves would have been difficult to remove deadweight were a soldier to fall overboard. Furthermore, with the exception

[168] Hammond 1991, 76; contested in Bartsoikas et al. 2015, which argues that tomb belonged to King Arrhidaeus and the armor and supports an interpretation that the armor was made for Alexander the Great.
[169] The leather-strip skirt worn by Greek, and later Roman, soldiers.
[170] Borza 1987, 113-115.
[171] Borza 1987, 115.
[172] Hdt. 7.89.1- 7.96.1.

of *epibátai*/marines, most classes of soldier in descriptions of naval personnel were lightly armored.[173] Regardless of the precise reason, the historical record is largely unhelpful concerning greaves in naval contexts.

Literary Evidence for Piracy

The first mentions of considerable pirate activity in the Mediterranean come from Egyptian sources. The so-called Sea Peoples from Phoenicia were a recurring threat to Egyptian ports and commerce. A collection of 362 clay tablets carrying correspondence between the king of Babylon and Pharaoh Amenhotep (or his son Akhenaton), referred to as the Amarna Letters document increasing aggression of these sea raiders as they began plundering ships and seizing towns.[174] One of the earliest recorded occurrences on the tablets recounts pirates attacking a ship in 1350 B.C.E.[175] The level of documentation these writings provide allows us to clearly interpret the Egyptian perception of these pirates as thieves, rather than generic adversaries harassing Egypt from the Mediterranean. The Lukka and the Sherden, two ethnic groups within the Sea Peoples, are mentioned as especially troublesome in the Amarna letters. Nearly a century later, recorded on the Tanis Stele during the reign of Ramesses II, is a statement which reads "the unruly Sherden whom no one had ever known how to combat, they came boldly sailing in their warships from the midst of the sea, none being able to withstand them."[176] Pirates are mentioned across a number of sources, but primarily in terms of how they inconvenienced the agents of major states to which historical authors belonged. This means that, while their origins, methods,

[173] Hdt. 7.89.1- 7.96.1.
[174] Armstrong 2003.
[175] Amarna Letter EA101; Vallar 2009.
[176] Kitchen 1982, 40–41.

and effect on travel and commerce are mentioned in ancient literature at some length, details concerning their actual equipment/armament are not very robust. Perhaps our most informative source in this regard is the Medinet Habu relief (Fig. 1.3), which depicts soldiers in the Sea Peoples fleet in armor and using spears and swords.[177]

Piracy appears to have been exceedingly common throughout ancient Greek history, and in the Bronze/Archaic Age, did not the same criminal stigma with which it is treated in most modern societies. A number of Bronze Age and Archaic texts from the Greek world condone it as a practice or even profession. Again, in Homer's *Odyssey*, the protagonist Odysseus casually tells an old shepherd about engaging in piracy or sea-raiding fleetingly out of boredom.[178] Both his inclination to use this as a lie in the first place, and the lack of any reaction from the shepherd gives the impression this was not an unreasonable occupation to claim. Odysseus and his crew also engage in an unsuccessful piratical raid on Ismaros, a city of the Cicone people, potentially a fictional Thracian tribe.[179]

Supporting this notion is an excerpt from Thucydides[180] who, writing some two centuries later during the Peloponnesian War, mentions how in earlier eras piracy among both Greeks and foreigners was regarded as an almost honorable profession:[181]

"For in early times the Hellenes and the barbarians of the coast and islands, as communication by sea became more common, were tempted to turn pirate…indeed, this came to be the main

[177] Murnane 1980, 14.
[178] Hom. *Od.* 1.4
[179] Hom. *Od.* 9.39-42.
[180] Polyb. 1.5
[181] Ormerod 1996, 68-69; Bound and Vallintine 1983.

source of their livelihood, no disgrace being yet attached to such an achievement, but even some glory."

On other occasions when going ashore, Odysseus carefully selected a portion of his crew to join him on land so as not to appear as pirates.[182] Despite that, the newcomers were often queried about being pirates when arriving in new lands, such as in Pylos[183] and the island of Cyclops.[184] The fact that Odysseus had to take great care not to appear as a pirate – and often unsuccessfully – is telling. He and his crew were sailing on a warship and, as they were returning from Troy, presumably carried their panoplies with them. This would suggest that pirates were easily confused with soldiers based on their appearance.

The term "pirate" has origins in two Ancient Greek words, *leistes* and *peirates*.[185] Homer uses *leistes* in various forms, as do other ancient Greek authors like Andocides, Thucydides, Plato, and Herodotus. It is also used to refer to terrestrial thieves. *Peirates,* however, only appears in later literature but is used – including its Latin derivatives (*pirate*) – through the end of fourth century C.E.[186] The first dateable usage of *peirates* is from the city of Rhamnous, Attica in a third-century B.C.E. inscription honoring Epichares' election as a *strategos* in charge of coastal defense.[187]

[182] Hom. *Od.* 9.195.
[183] Hom. *Od*. 3.73.
[184] Hom. *Od*. 9.252-255.
[185] de Souza 1999.
[186] de Souza 1992.
[187] de Souza 1999, 3.

In the central Mediterranean, the Etruscans had a long-standing reputation for piracy dating back to the early days of their contact with Greek colonists.[188] The strength of pirate flotillas can be indirectly evidenced by the records of defenses built to repel them. By the fifth century B.C.E., the threat of Etruscan piracy was apparently so severe that Anaxilaos, the tyrant of Rhegion, was forced to construct coastal defenses to fortify his territory against the pirates.[189] Around the same time, the Hellenic community of Lipari also built defensive measures against these raiders.[190] This evidence and similar passages[191] were only explicitly questioned in academic literature starting in the early 1990s.[192]

Into the Hellenistic period (330 – 31 B.C.E.), as Alexander the Great's empire in the eastern Mediterranean gradually collapsed, piracy became a more widespread and a severe problem for not only the successor kingdoms but also the developing Roman Republic. Initially, the powers that were did not hesitate to take advantage of piratical neighbors. On one occasion, the Macedonian king Demetrius (294 – 288 B.C.E.) bribed King Argos of Illyria to come to the aid of the town of Medion, which was being besieged by the Aetolians. Argos sent 100 ships containing a force of 5,000 men during the night. This force made landfall at the nearest point on the coast to Medion. The Aetolians were surprised but prepared for battle, forming up both hoplites and cavalry. The Illyrians, whose troops are described as "light infantry," pushed them back due to their superior numbers and the "weight of their formation." Eventually, with the assistance of the Medionians, the Illyrians routed the Aetolians taking a "[large] number of

[188] Ward-Perkins, 1959.
[189] Strab. 6.1.5
[190] Strab. 6.2.10
[191] His general sentiment is summarized in Strab. 5.2.2
[192] Spivey and Stoddart 1990

prisoners, capturing all their arms and baggage…[before sailing home]."[193] This passage is informative for several reasons. Despite being described as pirates, the Illyrians are more numerous than a traditional army, and that they capable of using infantry formations in a pitched battle.

However, the Illyrians became an immediate threat to Rome – among other states – when Queen Teuta, Agron's wife, succeeded him following his death. As her first royal decree, she "…gave letters of marque to privateers to pillage any ships they met, and next she collected a fleet and force of troops as large as the former one and sent it out, ordering the commanders to treat all countries alike as belonging to their enemies."[194]

The Illyrian pirates were also not alone in harassing Mediterranean shipping during the Hellenistic period and Rome's rise to dominance. Crete was an independent polity, but civil wars had ravaged the land, forcing much of the population into piracy.[195] Crete became a major haven for pirates, with its strategic location in the middle of the Mediterranean and freedom from direct control by any of the major Mediterranean powers.

There was also a significant pirate presence in the Levant, primarily comprised of Jews in the second half of the Hellenistic period. The influence of the Seleucid Empire in the region declined as a result of the Maccabean War (167 – 160 B.C.E.), and this allowed for an increase in Jewish

[193] Polyb. 2.3.1-8
[194] Polyb. 2.4.7
[195] Perlman 1999

– and sometimes Arab – pirates operating from the Levant. Despite the lack of an explicit literary mention of Jewish piracy until the first century C.E.,[196] there is a depiction of a pirate ship following two merchant ships inside a stone-cut burial chamber known as Jason's Tomb (first century B.C.E.) in Jerusalem. The drawing depicts three ships, two merchant vessels pursued by a monoreme war galley. The warship is identified as a pirate vessel due not only to its apparent pursuit of civilian vessels, but also by the fact that uses both rowers and sail. While ships preparing for battle would furl their sail or leave their mast and sail on shore, pirates kept theirs during action for increased speed in pursuit or flight.[197] This interpretation was first proposed by Lionel Casson in reference to a sixth-century Attic cup showing a similar image.[198] There is also the aforementioned Aristonothos krater from Italy (Fig. 1.8). While there is no apparent consensus concerning the precise identity of the non-Greek vessel depicted on the krater,[199] if it proves to be an Etruscan one, along with an eighth-century fibula with a nearly identical scene, these could stand as evidence of Etruscan pirates being confronted by armed Greeks. Supporting this interpretation is that while both vessels are well-armed and prepared for combat, the "Etruscan" ship still has its mast up contrary to military strategy, but in line with Casson's thoughts about pirate's desire for speed at sea.

In fact there were so many Jews at sea during the time of Pompey, some of whom were pirates, that king Antigonus II Mattathias was accused of sending them out to sea on purpose.[200] Pompey is known to have captured Jerusalem in 63 B.C.E., shortly after his campaign against the Cilician

[196] Josephus, *Bellum Judaicum* 3.9.2, translated by W. Whiston, hereafter Joseph. *BJ*
[197] Rahmani 1967, 71
[198] Casson 1991, 78.
[199] Dougherty 2003, 36.
[200] Jahn 2010.

pirates.[201] It is possible this was done to quell a two-headed pirate threat, as well as the political instability in the region that fueled it.[202]

The largest pirate stronghold, however, was Cilicia in southern Turkey. Like Crete, Cilicia enjoyed excellent natural harbors that the rugged coastal geography made difficult to locate and easy to defend. The Seleucids, who ostensibly ruled over the majority of Cilicia, were too weak to enforce the rule of law. In fact, Diodotus Tryphon, ruler of the Seleucid Empire in the mid-second century B.C.E., offered them support in order to strengthen his contentious position and benefit from their slave-trade.[203] Seafarers of multiple nationalities made their way to Cilicia in pursuit of safety and profit.

According to Cassius Dio, one of the reasons why piracy was such an appealing prospect was because of the constant warfare around the Mediterranean, as many fugitives from war took up piracy due to disruption of their normal way of life.[204] The aforementioned Jewish pirates were refugees from the Great Revolt.[205] Across the Mediterranean, when Quintus Sertorius, the rogue Roman general, was forced to flee Iberia, he joined a group of Cilician pirates. Together they attacked and seized Pityussa, the southernmost of the Balearic Islands, to use as a base of operations. When the governor of Hispania Ulterior discovered this, he sent a war-fleet and almost a full legion to expel Sertorius and the pirates from the Balearics.[206]

[201] Josep. *BJ.* 1.141.
[202] Leach 2013, 92.
[203] Strab. 14.5.2.
[204] Perlman 1999.
[205] Josep. *BJ.*
[206] Plutarch, *Vitae Parallelae, Sertorius*, translated by B. Perrin.

Such was the success of the pirates that Plutarch informs us that not only the desperate and displaced joined the Cilicians. Allegedly, " [men] whose wealth gave them power, and whose lineage was illustrious, and those who laid claim to superior intelligence…"[207] took up piracy, and in some cases even joined with the Cilicians in the pursuit of wealth and heightened reputation. Rome was rapidly losing control of the situation, with high-profile citizens flagrantly disrespecting Roman law to the point that *"*[t]heir flutes and stringed instruments and drinking bouts along every coast, their seizures of persons in high command, and their ransoming of captured cities, were a disgrace to the Roman supremacy."[208] This shows that piracy was outside the realms of lawful society and generally viewed as a dishonorable profession but it still retained a level of romanticization in popular society that drew individuals to it. This made it both an exterior and interior threat to Roman society as it presented a direct physical and financial threat, as well as an erosive force undermining the rule of law. Therefore, when Mithradates IV of Pontus hired Cicilian pirates to harass Pompey's war efforts in the region, the Roman commander made a concerted effort to systematically destroy their strongholds throughout the Mediterranean.[209] Piracy would continue in the Mediterranean in the last days of the Roman Republic , as evidenced by an uptick in Illyrian and Liburnian piracy. The situation motivated Octavian to sponsor a military operation in the Illyricum province in 35 B.C.E., to finalize its subjugation under Rome.[210] Ancient sources also document the use of pirates by

[207] Plutarch *Vitae Parallelae, Pompeius* 24.2, translated by B. Perrin; hereafter Plut. *Vit. Pomp.*
[208] Plutarch *Vit. Pomp.* 24.4..
[209] Plutarch *Vit. Pomp.* 24-25.1.
[210] Appian, *The Foreign Wars, The Illyrian Wars* 12–16, translated by H. White; Cass. Dio. 49.38.3.

Rome to fuel its insatiable need for slaves.[211] However, piracy existed in a reduced and significantly less organized manner, not reaching its prior severity until after the fall of Rome.

Throughout this period, however, pirate activity and action taken against them is most frequently discussed broadly in terms of campaigns rather than specific battles or one-on-one raids. Consequently, the extant personnel descriptions and step-by-step battle accounts for traditional warfare are absent in these instances. Therefore, details on pirate armament are scant. There are, however, occasional descriptions of piratical activity that coincidentally mention their weapons and garments. One such account concerning the Illyrians states:

> "Teuta, when the season came, fitted out a larger number of boats than before and dispatched them to the Greek coasts…a part put in to the harbor of Epidamnus, professedly to water and provision…They were received by the Epidamnians without any suspicion…lightly clad but with **swords** concealed in the water-jars, they cut down the guards…"[212]

Another from Josephus, describes a tragedy when a Jewish pirate fleet off the coast of Judea fell victim to a violent storm. Josephus claims that "…some of them thought that to die by their own swords was lighter than by the sea, and so they killed themselves before they were drowned."[213] While superficially helpful, these passages are neither frequent nor detailed enough to provide even a moderate understanding of personal equipment. It cannot be assumed that the description of Illyrians at Epidamnus is representative of their normal attire as they were attempting a covert infiltration. Furthermore, it is hard to discern whether Josephus' mention of swords is literal or metaphorical. However, from the overarching literature, it is known that pirates operated

[211] Diod. Sic. 36.3.
[212] Poly 2.9.1–3
[213] Josep. *BJ*. 9.3

similarly to and were sometimes comprised of contemporary militaries. Through numerous references like those included here, it is clear that large fleet actions were a recurring event, and that they were often well equipped and funded through government support. In Homer, pirates may be confused with soldiers, and that war refugees – including former soldiers – would join pirate crews. Furthermore, from visual depictions it is known that vessels resembled other contemporary warships. Therefore, on a general level, one can safely assume that pirate vessels and the pirates themselves were armed in a comparable fashion to contemporary militaries as only then would they pose significant threat to cities and coastal communities. This is not an entirely novel conclusion. Peregrine Horden and Nicholas Purcell noted that ancient piracy and warfare can be hard to distinguish from each other.[214] Hopefully, the excavation of more sites like the Kyrenia shipwreck and discovery of artifacts - like the fragmented Spargi helmet - relating to piracy in the archaeological record, can help create a more distinct understanding of ancient Mediterranean pirates.

Other Mentions of Weapons at Sea

While mentions of specific weapons in naval contexts appear to be exclusively contained within mythological or military narratives, written sources also inform us that soldiers were aboard civilian and merchant vessels. Hiero II's (reigned 270 – 215 B.C.E.) gargantuan transport ship *Syracusia*, is reported as having a complement of 200 soldiers on board for protection.[215]

[214] Horden and Purcell 2000, 153-160.
[215] Ath. 5.40.

In *Acts* 27 of the Bible's New Testament, the evangelist – and later saint – Paul is brought back to Rome by ship to face trial with an escort of Roman soldiers including a centurion. The ship is caught up in a storm and wrecked with a loss of cargo, but with Paul's guidance the crew all successfully reach Malta alive.[216] It is unclear whether they kept or jettisoned their personal gear, but a suggested plan for the soldiers to kill the prisoners to prevent escape immediately before abandoning ship suggests that they retained at least some weapons.[217] If the military escort did indeed reach Malta with the majority of their equipment, their presence on the vessel would be largely indiscernible in an archaeological excavation. Had the military personnel perished during the wrecking however, it would have produced an assemblage resembling many in the catalog presented in this thesis, with a handful of weapons and armor dispersed throughout in an otherwise mercantile shipwreck.

While less direct in terms of evidence (and beyond our time frame), we know that the *Classis Africana Commodiana Herculea*, a provincial fleet in the imperial Roman navy, was established in 186 C.E. by emperor Commodus to protect the vital grain imports (*annona*) from North Africa to Rome.[218] Grain imports were the life-blood of the Roman heartland, and would have been of the utmost import to protect from theft. There is no reason why crew of the *annona* vessels would not carry armament to ward off raiders.

[216] The Bible, Acts 27:1-43, NIV.
[217] The Bible, Acts 27:42, NIV.
[218] *Scriptores Historiae Augustae, Vita Commodi*, 17.7, translated by D. Magie.

While we lack equipment details in all these cases, it is clear that we should not expect weapons and armor to be limited to military vessels and battle sites. Ships of all functions required protection from possible attack.

Literary Review Summary and Research Goals

It is important to keep in mind that, as this study has attempted to show, there were often multiple terms for any given weapon or armament in ancient texts, and their meaning could overlap or change depending on specific context. However, narrowing the available terminology allows us to focus our analysis on the most relevant passages for our purposes here.

What Literary Sources Tell Us

Literary sources are a powerful tool for analyzing ancient maritime activity and naval action. As shown, they provide a considerable amount of information on how ancient forces were equipped, and how armament varied (or remained the same) across different military contingents in the ancient world. Without sources like Thucydides (7.67.2) and Diodorus Siculus (20.51.2) one would have little indication that the ability to hurl javelins from a braced, seated position was an important part of military training and strategy. Written sources are also our only real means of locating these battles (as in the case of the Egadi Islands). Despite the general lack of discovered ancient naval battle sites to date, however, without written accounts there would be no clues as to even knowing where to look for the sites.

Limitations of Literary Sources

While these benefits make literary review an important field of study, ancient literature – like any category of evidence - is not without its shortcomings. Often armor and weapon types are mentioned with little detail beyond a single adjective, and it is largely impossible to create specific typologies based purely on literary sources. Issues of translation must be considered, as well as authors' use of potentially unique or atypical words. Homer's interchangeable use of *xíphos* and *phásganon* has already been noted,[219] but it is impossible to know if Homer's usage of these words refers to the same sword type, if one is considered a sub-class of the other, or if two different sword types are described.

There are also on occasion contradictions amongst authors concerning historical events. Xenophon reports Callicratides falling into the sea and disappearing during the Peloponnesian War, while Diodorus says that the Spartan admiral was struck down directly in hand-to-hand combat. In another example Polybius appears to contradict himself concerning the date for the Roman military's adoption of the *gladius*. Much of this, along with other potential errors in ancient sources, results from the fact most ancient authors were not directly involved with the events they recorded. On many occasions the events they relate occurred before their lifetime, often many generations earlier. Homer, if he is an actual person, is thought to have lived centuries after the Trojan War. The *Iliad* of Homer, in its written form, is an eighth-century B.C.E. text purporting to document 12th-century Bronze Age events.[220] Herodotus lived and wrote partially concurrently to the events he described, but received much of his information

[219] Wace and Stubbings 1962, 517.
[220] Vidal-Naquet 2000, 19.

second-hand and admitted to not completely trusting those sources himself.[221] Plutarch was born c. 46 C.E., but serves as a primary source for events as far back as the life of Alexander the Great, who ruled in the fourth-century B.C.E. For example, Plutarch's *Life of Pyrrhus* is the only extensive text recording Roman history immediately prior to the Punic Wars (c. 293–264 B.C.E.).[222]

All three Punic Wars were documented primarily by Polybius, Diodorus, Livy, and Appian. Only Polybius (c. 200 – 118 B.C.E.) lived roughly contemporaneously with the wars in question. Even then, he was only directly involved with the Third Punic War, serving as a counselor to the Roman commander Scipio Aemilianus during the latter's campaign in North Africa. Diodorus was born (c. 90 B.C.E.) over 60 years after Scipio sacked Carthage at the end of the Third Punic War. Livy was born about the same time, and Appian a century later in c. 95 C.E. (and thought to have died c. 165 B.C.E.). This would have meant the latter author was likely writing sometime around 140 B.C.E., two centuries after the Third Punic War and three centuries after the First Punic War. Additionally, as this list of historians suggests, the overwhelming majority of our ancient written sources are by Greek, and later Latin, authors, and thus their descriptions of armies outside their own cultures must be observed with some skepticism. Even when two sources are not at odds, due to second-hand sources, authors will present multiple options for what occurred instead of just one. For example, Herodotus's discussion of Salamis includes the following passage:

"Then the Hellenes… were putting out to sea the barbarians immediately attacked them. The rest of the Hellenes began to back water and tried to beach their ships, but Ameinias of

[221] Od. *Il.* 123
[222] Cornell 1995, 3.

Pallene…charged and rammed a ship. When his ship became entangled…the others came to help Ameinias and joined battle.[2]…but the Aeginetans [claim] that the ship which had been sent to Aegina…was the one that started it. The story is also told that the phantom of a woman appeared to them, who cried commands loud enough for all the Hellenic fleet to hear, reproaching them first with, "Men possessed, how long will you still be backing water?" (8.84.1–2).

Here Herodotus provides three separate versions for how the battle may have commenced. The last of these seems the most contrived and least likely, but the first two provide little chance for modern researchers to distinguish between them.

Another major drawback is that written sources focusing on or involving wars are almost exclusively narrate from the perspective of the victorious party, and have a tendency to retroactively justify or embellish their actions and those of the enemy. The ancient propensity to invent or insert a fictitious or mythical account within the historical record can be found in Herodotus' *Histories*. His use of fantastic story-crafting often contributes to the overarching glorification of Greeks in the Greco-Persian wars. His claim that Xerxes's invading force of 480 B.C.E. consisted of 2.5 million troops[223] makes the eventual success of Greek resistance all the more impressive, but is generally considered to be an extreme exaggeration.[224] While these accounts can sometime appear plausible at a glance, in a more obviously absurd example, Herodotus claims the existence of dog-sized ants in India that dig up gold (3.102).

Concerning the Punic Wars, all three of the major literary sources are written from the Roman perspective. Polybius was friend and counsellor to Scipio during the general's conquest of

[223] Hdt. 7.186.
[224] de Souza 2008.

Carthage. Livy was closely linked with the Julio-Claudian dynasty of Rome's early empire and a friend of Augustus.[225] While Polybius is generally considered a level-handed documenter of events and diligent researcher,[226] the historian's personal affiliations and involvement, as well as his role in Roman state-building (by glorifying the figures and events surrounding Rome's rise to power) gives no small reason to question his objectivity. For the purpose of this study, there are additional direct shortcomings, such as a lack of detail in describing armament, peculiarities of word use or choice, use of second-hand sources, and the bias of the authors, which can confuse potential historical accounts.

The Contribution of Archaeology

Archaeology has the potential to clarify many of the questions and ambiguities generated by a purely literary approach. In terms of indirect evidence, iconographic sources are our only basis for meaningful insight on some of the armor types that may not be preserved archaeologically in marine contexts, like linen corslets and woven wickerwork shields. They also provide us with an understanding of how weapons and armor were employed in battle, as well as broader tactics used during large scale naval battles, often painting a detailed picture of how battle played out on both macro and micro scales. However, such iconography could be subjective to artistic interpretation and other obstacles.[227] Direct evidence, like the physical examples of ancient weapons and armor which are the subject of this study, obviously provide much more in the way

[225] Tacitus. *Annales*. 4.34, translated by A.J. Church and W.J. Brodribb.
[226] De Laix 1969, Davidson 1991; Moore 2013.
[227] Such as an artist depicting an event at which they were not actually present, or concerning a subject where they lack technical expertise

of precise visual details and typological characteristics, allowing academics to create typologies of material culture.

The literary evidence gives the impression that swords were a non-factor in Greek naval combat, but may have risen in popularity with the Romans. Archaeology could clarify if this reflects practical patterns of combat over time or simply cultural priorities in documentation (Chapter III, 148-154). Furthermore, there is potential to see if changes in sword type correlate with changes in predominant literary terms used to reference swords.

The presence of the large and heavy hoplite shield, standard equipment for hoplites in terrestrial warfare, in naval warfare is also in question. The terms used for shield in naval passages, *hoplon* and *aspis*, could also refer to other armor components or shield variants. The discovery of any shield remnants at marine sites could help elucidate what types of shield were in use. Moreover, in ancient literature the material composition of armor in general is often not specified. If archaeology reveals a considerable amount of metal armor, it greatly informs how men-at-arms were equipped at sea. Conversely, if such armor is not found, it would indicate non-metallic armor variants like the *linothṓrax* may have been used.

Archaeology could also potentially provide a picture of a topic essentially non-existent in ancient Mediterranean texts, specifically how merchant ships may have equipped themselves to protect against attack. The relative lack of documentation concerning ancient piracy, in conjunction with the fact that the vast majority of shipwreck sites with weaponry are merchant vessels means that

the archaeological data presented in the following chapter of this thesis has significant potential to inform modern research on ancient piracy.

This is significant because, as the Classical historian Philip de Souza has stated, "…all evidence of piracy in the Graeco-Roman world is textual. Piracy is not a phenomenon which can be documented from the material remains of Classical civilizations."[228] We can potentially challenge this statement and general school of thought should we be able to establish a plausible connection between these shipboard armaments and areas of documented pirate activity.

Archaeological evidence indicating the presence of pirates or raiders can potentially be seen in the case of the Kyrenia shipwreck, whose hull has spear or javelin heads lodged in its exterior.[229] The discovery and context of bronze helmets on wrecks such as Giglio and the early Roman Spargi shipwreck has been used to support the argument that an attack must have occurred near the time of the sinking event, and that the crew members were likely attempting to defend against pirates or other hostiles.[230]

The region of Lycia in the present-day Antalya province of Turkey, was a well-known pirate base of operations. The Lycian coastline's many coves and inlets were ideal for raiders waiting for merchant ships travelling along the eastern Mediterranean trade routes. In 1194 B.C.E., Ramses III of Egypt destroyed these havens, but such was this region's appeal for these purposes

[228] de Souza, 1999.
[229] Katzev 2007.
[230] Strauss 2006, 154.

that pirates eventually returned there and assisted Xerxes during his 480 B.C.E. invasion of Greece.[231] Illyria (western Balkans) and Phoenicia were also enduring pirate havens.[232]

If wreck locations with armament finds can be matched to areas with significant records of pirate activity, one could make an argument for the presence of armor and weaponry as evidencing pirate activity. Of course, this would be most convincing for ships with stronger evidence for violence around the sinking incident, as with the Kyrenia and Spargi shipwrecks. As a number of wrecks have been located around the Tyrrhenian Sea and the coast of Sicily, there is the opportunity to evaluate whether the archaeological material provides evidence of Etruscan victimization of Greeks. Such evidence would be constituted by appropriately dated Greek wrecks with weapons at known points of Greek-Etruscan tension and – ideally – signs of violence, like peri-depositional damage to artifacts. Hopefully, this can help us confirm or contradict the Classical Greek narrative of relentless Etruscan harassment. Over the course of the following catalog and analysis, patterns in the archaeological data will be elucidated which provide insight into how Mediterranean merchant vessels armed themselves at sea against attack, allowing us to confirm or contradict literary testimony regarding pirate activity in the Ancient Mediterranean

[231] Vallar 2009.
[232] Semple 1916, 140.

CHAPTER II: CATALOG OF ARMAMENT FROM ANCIENT MEDITERRANEAN SHIPWRECKS

The purpose of this catalog is to present weapons and other personal armament from ancient maritime sites in the Mediterranean, primarily shipwrecks.

The catalog begins with large assemblages (**1–3**), which I define as those containing 10 or more relevant artifacts. Large groups of armament on shipwrecks provide compelling information about the nature of maritime activity as well as the number, and perhaps even identifying features of the people involved, such as nationality, wealth, and social status. Where a single spear may appear on a ship for any number of reasons, large groups of military artifacts allow us to ask different questions such as what were the perceived risks of a given voyage and the full range of weapons used to defend vessels against attack. Large assemblages, therefore, are the most diagnostic. This will be followed by medium-sized assemblages (**4**–**13**) comprised of between three and nine artifacts. The catalog concludes with 19 sites (**14–32**) having "small assemblages" of only one or two artifacts. Within each of these three main divisions, the sites are organized chronologically, starting from the oldest site and moving to the most recent. Sites with relevant material but not indisputably maritime in nature or are otherwise ambiguous in their provenience or reporting appear in the Appendix.

Each site is numbered sequentially, and each artifact type (i.e. spear, sword, axe, etc.) within the assemblage from that site is assigned a letter. Each individual object within an artifact type is given a secondary number (e.g. 1A1, 1A2). Artifacts from each site are presented along the same lines as the information presented in Chapter I, reflecting the general course of action during an

ancient naval engagement. To reiterate, the catalog commences with long-range weapons like arrows, slings, and javelins before moving to mid-range melee weapons like spears. The difference between spearheads and javelin heads is often ambiguous as it is largely an issue of dimensions and for this we are largely reliant on the excavator's identification. It is important to keep in mind that while javelin heads are generally smaller and thinner than spearheads for improved range and accuracy when thrown, due to the range of types for both and the span of time with which we are dealing here, there are no clear dimensional guidelines for distinguishing between these the two categories. The same is occasionally true for arrowheads, but often these have tangs, and lack sockets or hollow midribs, which aid in their identification. These are followed by close-quarters weapons like swords, axes, and knives. Defensive armament, namely helmets and torso armor, are presented last. In many cases, particularly with the larger assemblages, not all the individual artifacts are fully published. Sometimes one or several are presented as an example of a large quantity of finds. In these cases, the total number of artifacts are mentioned at the beginning of their relevant section, but catalog entries are only provided for those published with details (i.e. dimensions, physical description, images).

The following template shows how catalog entries are formatted. All dimensions are presented in centimeters, and weight is reported in grams. The catalog descriptions are my own based on information provided in the site reports and relevant publications, which vary considerably in terms of the amount of detail provided.

Sample Catalog Entry (for multiple artifacts)

Name of Site

Artifact Type

Image						
ID	*Exc. ID*	*L*	*W*	*Th*	*Wt*	*Source*
		--	--	--	--	
		Description ----------				
		--	--	--	--	
		Description ----------				
		--	--	--	--	

Abbreviations Used

Abbreviation	***Meaning***	***Abbreviation***	***Meaning***
L	Length	Exc ID	ID/catalog number from original excavation
W	Width	N/A	Not Available
Th	Thickness	Priv.	Private
H	Height	max	maximum
Diam	Diameter	approx.	approximately
Wt	Weight	est.	estimated
cm	centimeters		
g	grams		
pH	preserved height		
pL	preserved length		
pW	Preserved width		
avg	average	RNMA*	Roman Naval Museum of Albenga
ID	Catalog Identification	PM*	Pontevedra Museum
D	Depth	CCM*	Coruna Castle Museum
c.	circa	MNA*	Museo Nazionale Agrigento

*These are abbreviations for artifacts where a museum inventory number is provided instead of a project catalog number.

1. Uluburun Shipwreck (Uluburun, Turkey) – c. 1320 B.C.E.

Arguably the most famous ancient Mediterranean shipwreck archaeologists have discovered to date, the Uluburun wreck is also one of the oldest. Discovered in 1982 on a steeply sloped rocky coastline, the wreck covered an area of approximately 10x8 m at a depth ranging from 42 to 61 m near the town of Kaş in southern Turkey. Its wealth of copper and tin ingots, luxury goods, and weaponry set it apart from many other cargo wrecks defined almost exclusively by their amphorae. The wreck's incredibly rich and varied cargo have allowed both radiocarbon and typological dating, placing the date of the shipwreck at c. 1320 B.C.E.[233]

1A. Arrowheads (32 arrowheads, some potentially javelins)

Seventeen points were discovered together, another group of approximately 11 arrowheads from around grid-square J–10. Better preserved examples are long and narrow, and typically display tangs that are either square or rhomboid in section.[234] Of the 32 total, there is the possibility some were javelin heads (corrosion reducing dimensions).

[233] Pulak 1988; Pulak 1998; Parker 1992.
[234] Pulak 1988, 23-24.

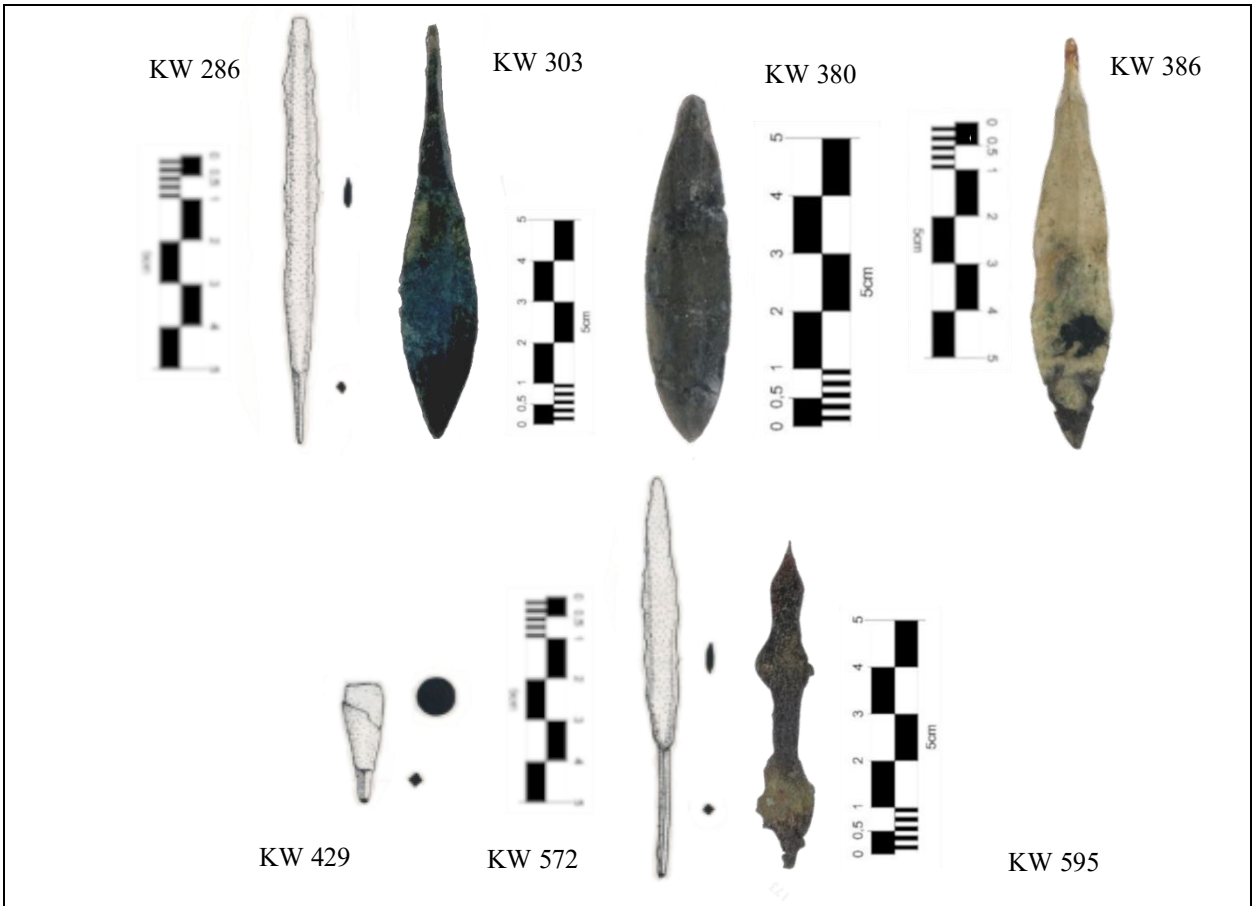


Figure 2.1: Uluburun arrowheads (After Pulak 1988 and Yalçin, Pulak, & Slotta 2005)

ID	*Exc. ID*	*L*	*W*	*Th*	*Wt*	*Source*
1A1	KW 286	pL 10.7	--	--	--	Pulak 1988
		Bronze javelin (?) point, approx. 80% preserved				
1A2	KW 303	10.1	1.5	0.6	4.7	Yalçin, Pulak, & Slotta 2005
		Bronze leaf-shaped arrowhead with long blade and soft central rib				
1A3	KW 380	6.0	1.7	0.4	1.3	Yalçin, Pulak, & Slotta 2005
		Bronze leaf-shaped arrowhead missing point; soft central rib				
1A4	KW 386	8.7	1.4	0.4	2.4	Yalçin, Pulak, & Slotta 2005
		Bronze leaf-shaped arrowhead; longitudinal ridge offset from center				
1A5	KW 429	10.7	6.0	1.0 -1.7	--	Pulak 1988
		Blunt bronze arrowhead				
1A6	KW 572	9.6	1.0	--	--	Pulak 1988
		Bronze arrowhead				
1A7	KW 595	7.0	1.2	0.5	5.5	Yalçin, Pulak, & Slotta 2005
		Bronze arrowhead with short bay leaf-shaped blade; eroded edges				

1B. Spearheads

Of the 22 spearheads collected from the Uluburun site, 10 exhibit shorter dimensions characteristic of Mycenean and Aegean types. Despite their varied dimensions, all the spearheads have leaf-shaped blades, and were fastened to their respective shafts with rivets or nails driven through holes at the base of their blades. With only one exception, all Mycenean examples had a seamless, solid-cast socket.[235]

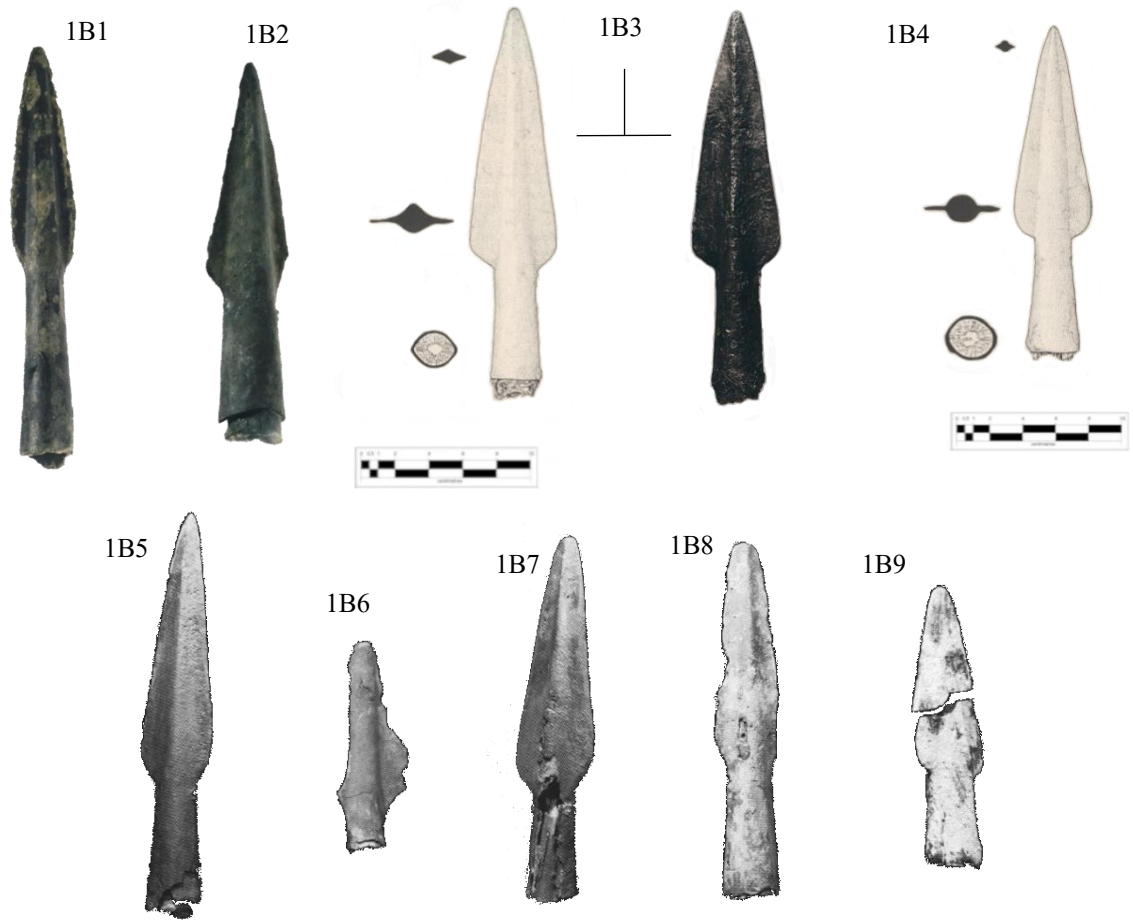


Figure 2.2: Uluburun spearheads (After Pulak 1997, 2005, and Yalçin, Pulak, & Slotta 2005)

ID	*Exc. ID*	*L*	*Diam.*	*W*	*Th*	*Weight*	*Source*
1B1	KW 77	20.5	--	3.6	1.2	104.4	Yalçin, Pulak, & Slotta 2005

[235] Pulak2008, 374-375.

		Bronze spearhead with narrow triangular blade and pronounced central ridge; circular shaft socket					
1B2	KW 120	15.6	--	4.2	2.7	119.4	Yalçin, Pulak, & Slotta 2005
		Bronze spearhead with narrow triangular blade and pronounced central ridge; circular shaft socket					
1B3	KW 309	25.0	3.4	4.7	--	--	Pulak 2008
		Bronze spearhead with triangular blade, large central rib; roughly circular shaft socket.					
1B4	KW 360	--	--	--	--	--	Pulak 1998
		Bronze spearhead with triangular blade and circular shaft socket; similar to **1B3.**					
1B5	KW 30	--	--	--	--	--	Pulak 2005
		Bronze spearhead with long, narrow triangular blade and pronounced central ridge; circular shaft socket					
1B6	KW 78	--	--	--	--	--	Pulak 2005
		Smaller bronze spearhead, missing one side of blade. Only Mycenean spearhead on site with split socket.					
1B7	KW 310	--	--	--	--	--	Pulak 2005
		Bronze spearhead with narrow triangular blade and pronounced central ridge; circular shaft socket					
1B8	KW 1520	--	--	--	--	--	Pulak 2005
		Bronze spearhead, narrow blade, corroded into narrow elliptical shape. Pronounced central ride; circular shaft socket					
1B9	KW 4885	--	--	--	--	--	Pulak 2005
		Bronze spearhead with triangular blade, similar to **1B4.** Point split across width halfway up blade					

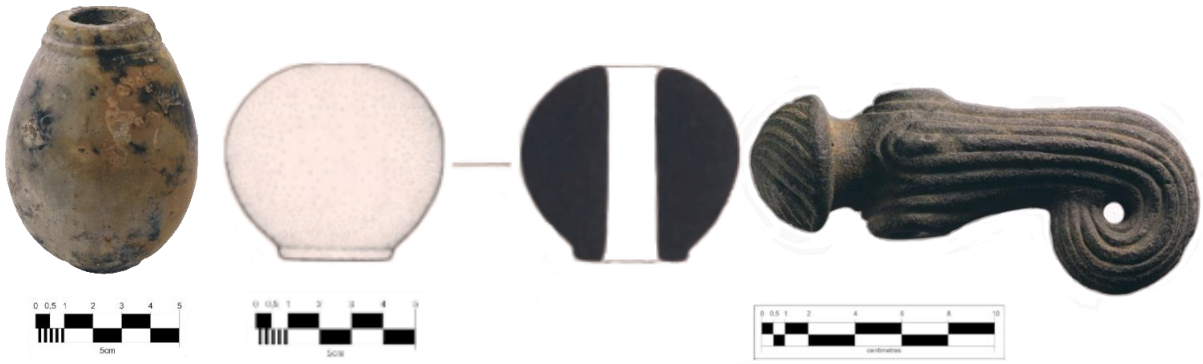
1C. Swords

Figure 2.3: Uluburun swords (After Pulak 1988; 1994 and Yalçin, Pulak, & Slotta 2005)

ID	*Exc. ID*	*L*	*W*	*Th*	*Wt*	*Source*
1C1	KW 155	37.5 pL	2.6	1.2	115.7	Yalçin, Pulak, & Slotta 2005; Pulak in Nicosia 2001, 45
		Bronze sword of Thapsos Culture; 70% preserved blade with pronounced blood groove missing both tang and blade edges. Three rivets at the transition to the missing handle plate.				
1C2	KW 275	pL 45.4	-	-	-	Pulak 1988, 20-22; Pulak 1994, 248; Pulak 1998, 208
		Canaanite sword with hilt and blade cast in one piece. hilt section flanged for containing inlays leaf-shaped blade is thickest approximately midway down its length. Two bands of incised grooves across base of blade.				
1C3	KW 301	pL 45.5	-	.9	-	Pulak 1988; Yalçin, Pulak, & Slotta 2005; Pulak in Nicosia 2001, 45
		Mycenaean sword poorly preserved; tip and tang end are missing. Three rivets at hilt attachment are cylindrical with slight pinch in				

		middle where they go through blade. Total original length likely 60+ cm, the minimum size for 'Class Ci' swords.				
1C4	KW 4193	51.3	-	-	-	Pulak 1994; Pulak 1998, 207
		Mycenaean short sword, flat and finely ribbed blade. Very similar to **1C3**.				

1D. Maces



1D1 1D2 1D3

Figure 2.4: Uluburun maceheads (After Pulak 1988 and Yalçin, Pulak, & Slotta 2005)

ID	*Exc. ID*	*L*	*Diam*	*H*	*Wt*	*Source*
1D1	KW 2	9.2	7.1	-	630	Yalçin, Pulak, & Slotta 2005; Bass 1986, 274
		Stone mace-head; roughly ovoid club head of gray stone. Centrally placed shaft hole offset by ridged collar.				
1D2	KW 486	-	6.7	-	-	Pulak 1988, 24
		Stone mace-head, dark polished stone, possibly diabase				
1D3	KW 2742	19.2	5.2	7.8	690	Yalçin, Pulak, & Slotta 2005, 372; Vulpe 1970; Pulak 2008, 372
		Stone scepter-mace head, possibly andesite. Hemispherical butt incised with spiral channels. Above smooth, recessed neck, parallel channels along several raised ridges come together at tip and curl back to form small loop. Overall shape reminiscent of Balkan examples. Type also linked with bronze examples from Carpathian-Pontic region.				

1E. Axes

Figure 2.5: Uluburun axe-heads (After Pulak 1988 and Yalçin, Pulak, & Slotta 2005)

ID	*Exc. ID*	*L*	*W*	*Th*	*Source*
1E1	KW 141	--	--	--	Yalçin, Pulak, & Slotta 2005
		Bronze lugged axehead, single-sided. Long trapezoidal blade with small tang/neck on narrow, rear end.			
1E2	KW 213	--	--	--	Yalçin, Pulak, & Slotta 2005
		Bronze shaft-hole axe, double-sided; Well preserved, symmetrical double-sided axehead. Shaft hole is oval with pointed ends.			
1E3	KW 587	19.5	6.2	.9	Pulak 1988, 15; Yalçin, Pulak, & Slotta 2005
		Bronze lugged axehead, single-sided. Identified as Maxwell-Hyslop Type II, most commonly from Palestine but also Syria, Egypt, Anatolia, and Cyprus. Faintly double-conical blade, flaring out slightly towards convex blade edge, narrowing towards curved neck.			
1E4	KW 2413	28.6	7.2	.9	Yalçin, Pulak, & Slotta 2005
		Bronze flat axe, single-sided. Almost perfectly rectangular blade, only slightly thickened in the middle.			
1E5	N/A	*Dimensions N/A*			Personal communication with Cemal Pulak
		Another axehead similar to **1E2** has been found but not yet published			

1F. Daggers

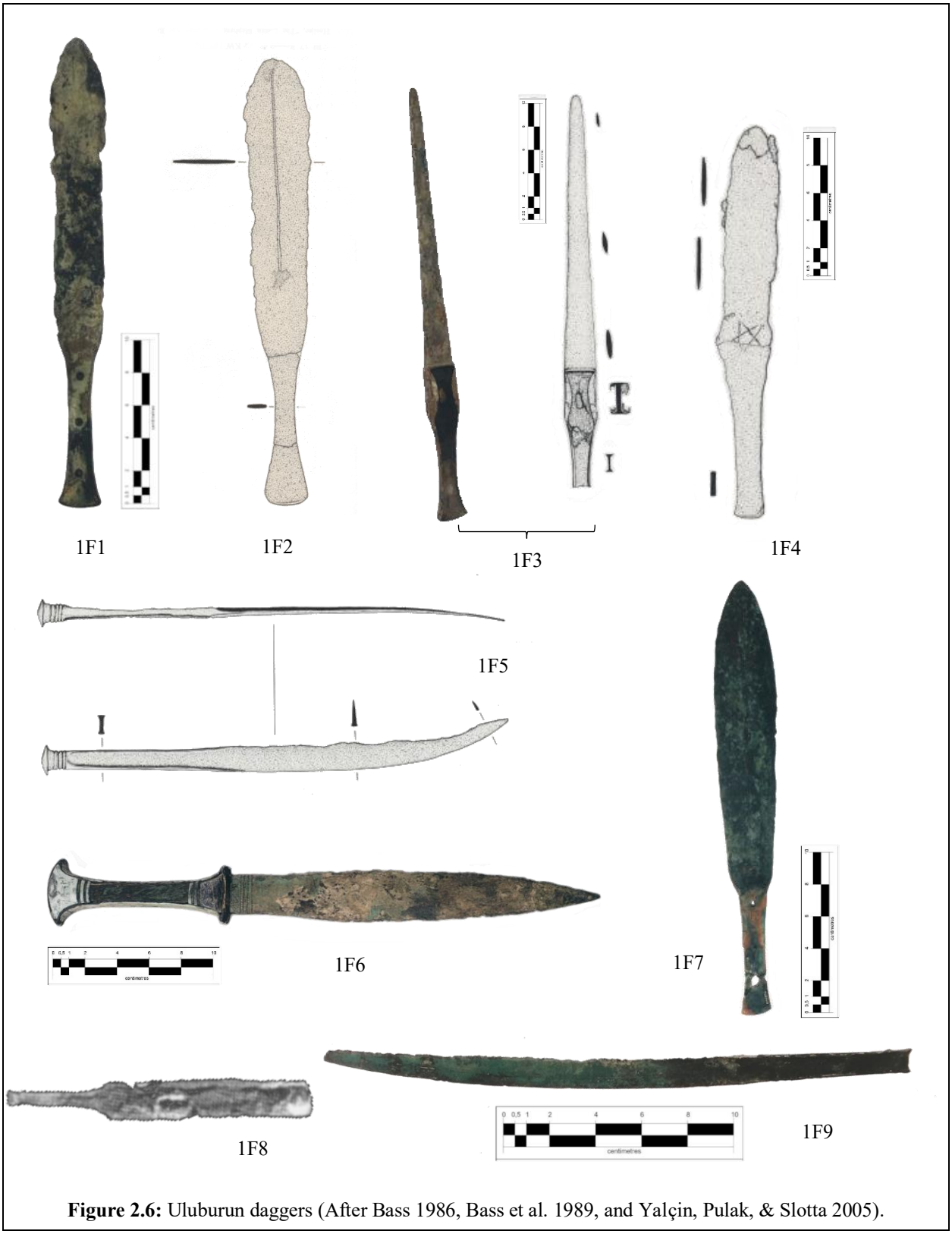


Figure 2.6: Uluburun daggers (After Bass 1986, Bass et al. 1989, and Yalçin, Pulak, & Slotta 2005).

ID	*Exc. ID*	*L*	*W*	*Th*	*Wt*	*Source*
1F1	KW 1	28.8	4.3	.4	86.5	Pulak 2008, 366
		Bronze dagger; Blade and handle cast together in a single piece. The long blade has an oval cross-section, and handle has three rivets and a conical knob				
1F2	KW 189	--	--	--	--	Bass 1986
		Bronze dagger. Shape resembles that of **1F1** but its dimensions are slightly larger.				
1F3	KW 296	pL 33.5	--	--	--	Pulak 1988, 22-23; Yalçin, Pulak, & Slotta 2005, 366
		Bronze 'dirk'; Narrow blade and handle tang cast together in single piece. Fragments of wood remain on handle, which has a conical knob. Blade and hilt are cast in a single piece. Grip has side flanges near the juncture which fold over the hilt plates (wooden inlays partially preserved but pommel missing) to create 'wings.'				
1F4	KW 621	pL 28.4	--	--	--	Pulak 1988
		Bronze dagger (or knife). It has a five-point star incised slightly above where the hilt joined the blade. Believed to be from the same general type as gaggers **1F1** and **1F2**.				
1F5	KW 800	--	--	--	--	Bass et al. 1989
		Bronze knife, cast in one piece. Its long thin blade curves slightly at its tip. the base of the handle terminates in a a pommel with a ridged neck and truncated conical knob. Associated with Aegean cultures				
1F6	KW 1393	34.6	4.1	.6	--	Cluzan 2008, 366
		Canaanite dagger; bronze blade with ebony and ivory overlays on handle				
1F7	KW 2896	27.1	6.6 (max)	.6	243.5	Yalçin, Pulak, & Slotta 2005
		Dagger/Short sword; Symmetrical Leaf-shaped blade with three central longitudinal grooves. Handle plate/tang has three rivets and a conical knob/butt.				
1F8	Lot 3243	--	--	--	--	Bachhuber 2003, 2006; Pulak 2005
		Only tang fragment remaining, faint flanges. Blade not preserved, likely similar to **1F5** and **IF9**				
1F9	KW 4452	25.5	1.3	.4	38.2	Bachhuber 2006; Pulak 2005; Yalçin, Pulak, & Slotta 2005
		Flanged edges at hilt end; missing terminal end (likely similar to **1F5**) Slightly curved blade with convex cutting edge. Associated with Aegean cultures				

1G1. Armor Scale

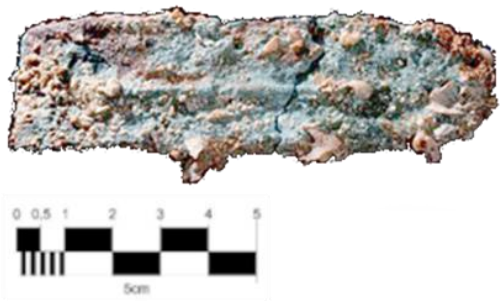


Figure 2.7: Uluburun armor scale (After Salimbeti 2020).

ID	*Exc. ID*	*L*	*W*	*Source*
1G1	KW 3807	9	3	Pulak 1988
A single large bronze armor scale of Near Eastern type. There is a fairly heavy layer of corrosion across its surface.				

2. Cape Gelidonya (Cape Gelidonya, Turkey) – c. 1200 B.C.E.

Cape Gelidonya was the first shipwreck site to be documented and excavated to archaeological standards, a project which began in 1960 under the direction of George Bass. It was discovered by sponge divers on an area of rocky seafloor between two islands close to a cape on Turkey's southern coast at a depth of 26-28 meters. The hull was highly fragmented, but preserved enough to provide valuable information on the use of mortise-and-tenon joinery in assembling hull planking during the Late Bronze Age.[236] Also present were a number of metalworking tools like a swage block and whetstones. The wreck is perhaps most famous for its collection of over 60 copper ingots and bronze tools likely intended as scrap metal for a traveling metalsmith or

[236] Pulak 1999, Parker 1992.

tinker.[237] While these latter artifacts were largely agricultural in nature, they also contained spearheads.

In a later series of return excavations (1987-88, 2010) additional artifacts were uncovered, including bronze knives and a sword.[238]

2A. Spearheads

Preservation of many examples is so poor, Bass admits that many may actually be knife or dagger fragments.[239]

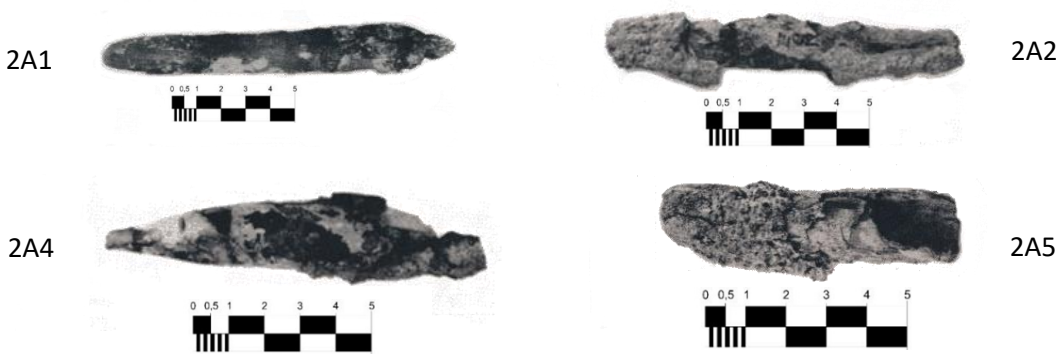


Figure 2.8: Cape Gelidonya spearheads (After Bass 1967).

ID	*Exc. ID*	*L*	*W*	*Socket D*	*Th*	*Source*
2A1	B162	14.7	2	--	--	Bass 1967, 105
		Bronze; Nearly parallel, slightly concave sides. Flat, triangular tang with two shoulder rivet holes. Rounded midrib				
2A2	B163	pL 10.5	1.8	0.9	--	Bass 1967, 105

[237] Bass 1967, Parker 1992.
[238] Parker 1992, Pulak 1988.
[239] Bass 1967, 103.

		Bronze; poorly preserved, concretion and chipping. No midrib, and open socket formed by wrapping the blade's butt. This spearhead and **2A1** identified as Catling's type *c.*[240]				
2A3	B164	pL 14.4	pW 2.3	--	--	Bass 1967, 105
		Bronze point with large, hollowed midrib that leads to a missing socket. Damage too extensive to provide any typological assessment.				
2A4	B165	pL 10.5	--	2.2	.5	Bass 1967, 105
		Start of bronze blade shows no evidence of a midrib.				
2A5	B166	pL 7	--	1.8	--	Bass 1967, 105
		Fragmentary with a solid bronze blade at the break, no evidence of a hollow midrib				

2B1. Sword

Figure 2.9: Cape Gelidonya sword (Photo Courtesy of Nicolle Hirschfeld)

ID	*Exc ID*	*L*	*W*	*Th*
2B1	B 264	pL 53.4	2.7 (mid.)	1.2 (hilt) / .6 (mid.) / .4 (tip)
Sources			INA Newsletter 1988, Bass Notes[241], Catling 1964	

Bronze sword was discovered during a return visit to the site in 1988 by then graduate student Cemal Pulak. Heavily concreted upon discovery; marked groove along unconcreted edge. Blade ovoid in cross-section. Hilt absent, but no sign of break or distinct tang. Hilt end does become slightly thinner. Identified as Type I in Catling Bronze Age sword typology. Sword to be included in forthcoming publication by Nicolle Hirschfeld.

[240] from a seminal typological analysis of Bronze Age weapons; Catling 1956.

[241] Dr. Hirschfeld kindly provided Dr. Bass' original study notes with dimensions and description to use as a resource, with additional information provided by Nicholas Blackwell through personal communication.

2C. Maces

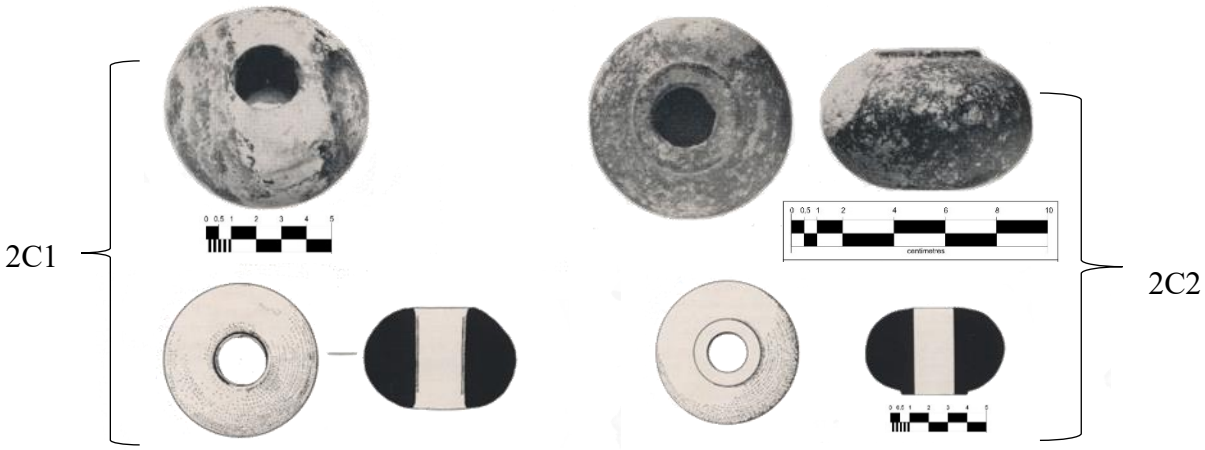


Figure 2.10: Cape Gelidonya maces (After Bass 1967)

Cat. ID	*Exc. ID*	*Diam*	*H*	*Source*
2C1	ST 1	8	5.2	Bass 1967, 126
		Spherical stone mace-head, greenish in hue. Socket runs straight through the center with remnants of bronze lining.		
2C2	ST 2	6.2	4.5	Bass 1967, 126
		Collared spherical mace-head. Made of a dark stone, likely diabase.		

2D. Axes

Figure 2.11: Cape Gelidonya axes (After Bass 1967)

Cat. ID	*Exc. ID*	*L*	*W*	*Th*	*Source*
2D1	B 101	17.5	6	socket interior: 4.5 x 1.7	Bass 1967, 95
		Almost complete, barring slight chips on edges. Even tapering of the blade from maximum thickness to both of the cutting edges. Central groove on one side of blades and a biconvex socket.			
2D2	B 102	pL 11.5	6	(at socket) 5.5	Bass 1967, 95
		Half of a double-axe broken in the middle along haft socket. Blade edges nearly parallel top and bottom, round socket and slight rounding of the blade edge - indicates this is Deshayes' type A , with rapid thinning of the blade past the socket.			
2D3	B 103	pL 10.5	4.8	(at socket) 4.2	Bass 1967, 95
		Another broken half of a double-axe. Similar in form to **2D2**, but with more pronounced flaring and rounding of the blade edge.			
2D4	B 104	--	--	--	Bass 1967, 95
		Removed from site in 1959; transported to America as souvenir. No dimensions for this artifact and type cannot be identified without socket shape. Double-headed; slight flaring to cutting edges.			

2E. Knives

Figure 2.12: Cape Gelidonya Knives (After Bass 1967)

Cat. ID	*Exc. ID*	*L*	*W*	*Th*	*Source*

2E1	B148	17	1.5	.3 - .1 (or less) at blade tip.	Bass 1967
		Well preserved bronze blade but slightly chipped. Flanges on both sides of the haft, which is slightly narrower than blade. Lack of rivets suggests flanges held the blade in place. Blade is mostly straight, but with slightly convex cutting edge.			
2E2	B149	pL 8.2	.9	.5	Bass 1967
		Fragmented bronze blade. The back of the preserved section curves downward to meet straight, sharp cutting edge at tip.			
2E3	B150	12.7	2	.4 at haft and .2 cm at tip	Bass 1967
		Fairly well-preserved bronze blade with a triangular haft and pointed but broken tip. Straight back and concave blade along its length, no rivet holes.			
2E4	B151	pL 7.5	2.2	--	Bass 1967
		Very short tapering bronze blade with slightly convex sides and rounded tip. Two rivet holes visible just above shoulder, third possibly located at break near preserved base. Narrow rhomboid in section. Diminutive size raises questions about function (utilitarian vs. military).			
2E5	B152	10.5	1.3	.2	Bass 1967
		Badly worn bronze blade, with a midsection slightly thicker than back and edge			
2E6	B153	7.3	1.4	.4	Bass 1967
		Highly eroded bronze blade with almost straight back and convex edge.			
2E7	B154	pL 7.6	2.5	.2	Bass 1967
		Bronze blade has a short tang and almost straight back which curves downward around the tip.			
2E8	B155	pL 6.2	1.6	.25 (max)	Bass 1967
		Bronze blade with straight cutting edge, which the back curves down to meet at the tip			
2E9	B156	pL 15	2.3	0.5	Bass 1967
		Highly worn bronze blade comprised of four fragments but missing both ends			
2E10	B157	pL 4.8	2	0.2	Bass 1967
		End fragment of an otherwise missing bronze blade.			
2E11	B158	pL 6.5	1.8	2.2 at blade middle, thinner at edges.	Bass 1967
		Bronze blade fragment missing both haft and tip. Possibly double-edged but poor preservation does not allow confirmation.			
2E12	B159	pL 5.2	2.2	.15	Bass 1967
		Bronze blade fragment with parallel edges, one of which is thinner than the other. Possibly due to wear rather than design.			

2E13	B160	pL 10	-	-	Bass 1967
		Seven fragmented pieces and one rivet from a single ribbed knife			
2E14	B161	pL 14	2	-	Bass 1967
		Similar to **2E13** in that it has a hollow rib, but also highly damaged.			

3. Egadi Islands Battle Site (Levanzo, Sicily, Italy) – Date: March 10, 241 B.C.E.

In 2006, the accidental discovery of a large bronze ram off the coast of Levanzo Island near Trapai, Sicily led to the revelation that an expansive site of amphoras, rams, and helmets covered 2 square km of seafloor at a depth of 100 meters. Widely thought to be the site of the Battle of the Egadi Islands between the fleets of Carthage and Rome at the end of the First Punic War, the site has been the subject of an ongoing survey and recovery project by RPM Nautical in coordination with the Sicilian Soprintendenza del Mare. The site is unique in terms of its scope and the approximately 23 bronze naval rams it has produced, representing the overwhelming majority of all known rams.

3A1. Sword

Figure 2.13: Egadi sword (Photo Courtesy of Soprintendenza del Mare)

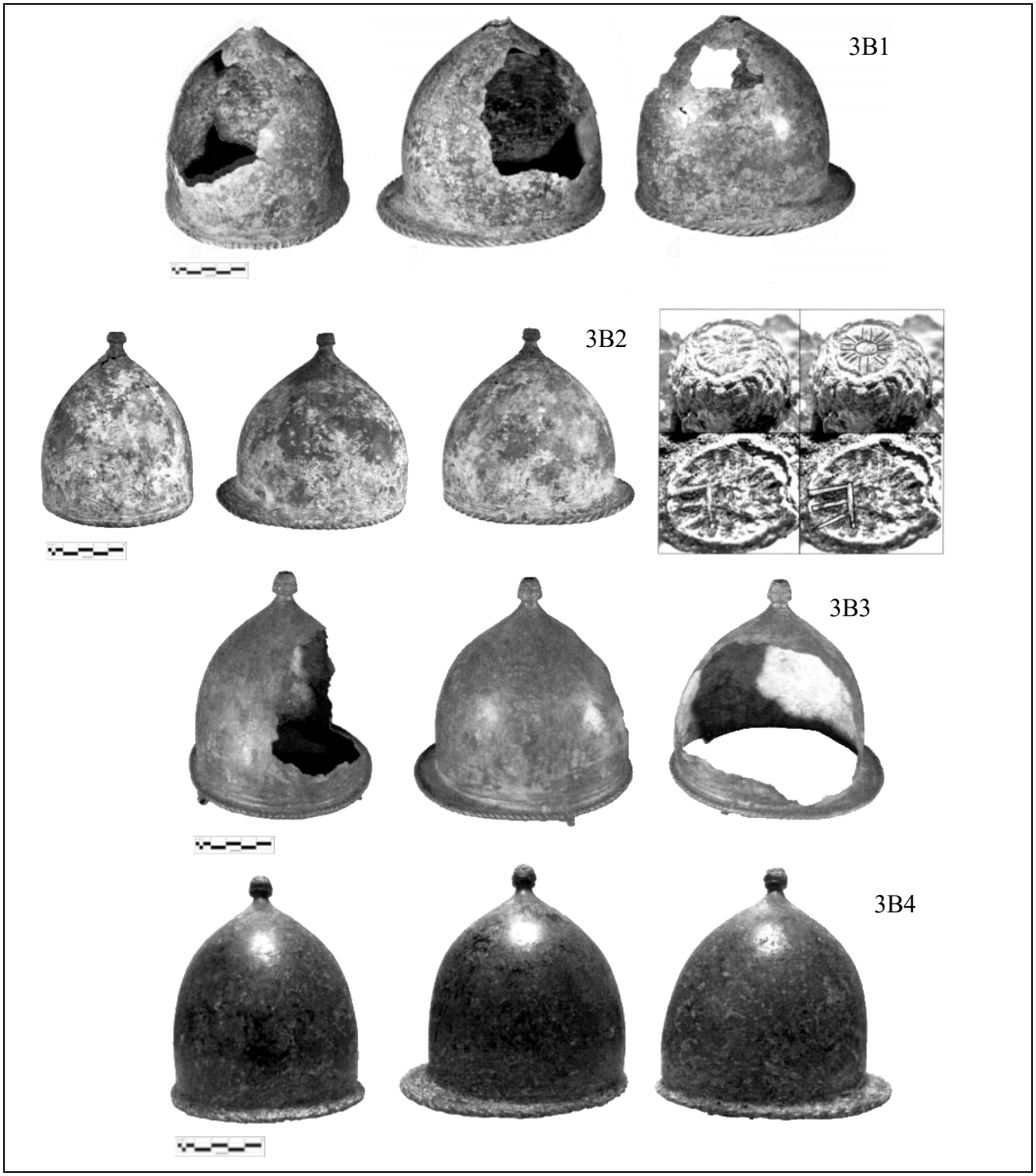
Exc ID N/A	L approx. 67	Max W approx. 7	Unpublished[242]
During 2019 field season, a long narrow ferrous concretion with a hollow core was recovered by professional divers (GUE). Identified with some confidence as sword blade. To date, unconfirmed if it is a *xíphos* or *gladius*, or other sword type. If proven to be gladius, it would represent earliest datable example of sword type. Sword CT/X-rayed by Sicilian Office of the Soprintendenza del Mare and currently undergoing analysis.[243]			

3B1-7 Montefortino Helmets

Width measurements designate ear-to-ear diameter, and length measures front brim to neck-guard diameter. Thickness measurements were taken at mid-bowl height.[244] In describing helmets, "bowl" indicates the dome which comprises the majority of the helmet, "rim" refers to the edge along the bottom of the bowl, and "brim" is used if the rim has a projecting of some nature (see **3D1**)

As of the latest official release, 12 bronze Montefortino helmets have been found across the expansive site, which covers some 3 square kilometers, at a depth of approximately 100 meters.[245] To date, seven have been published in peer reviewed articles, while the rest have been recovered recently and only published in news coverage of the site.[246] Of these seven, six were initially documented in a 2017 Master's thesis and republished in a chapter of the 2019 multi-authored volume on the Egadi site.[247] These seven helmets were all recovered between 2011 and 2013 with marine encrustation covering 80-100% of their interior and exterior surfaces.

[242] Author was working on-site at the time of discovery and wrote the project artifact card
[243] Georgopoulos 2019.
[244] Goldman and Rose 2019, 149.
[245] *Bronze Helmets* RPM Nautical Foundation, accessed 23 August 2020
[246] Bohstrom 2017; Georgopoulos 2019.
[247] Rose 2017; Goldman and Rose 2019.


3B1
3B2
3B3
3B4

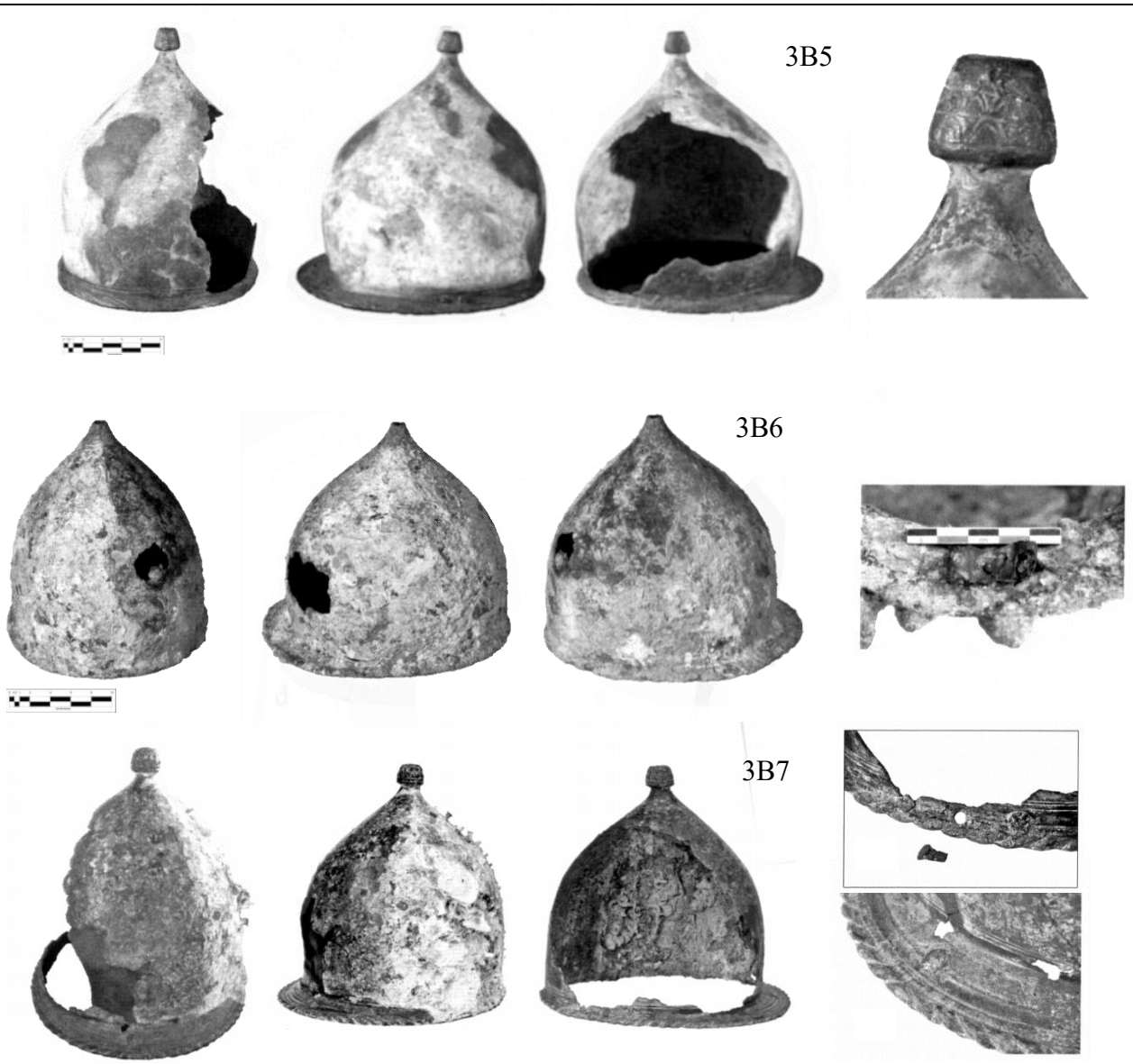


Figure 2.14: Egadi Montefortino helmets (After Goldman and Rose 2019)

ID	*Exc. ID*	*H*	*W*	*L*	*Th*	*Source*
3B1	PW11-0010	23.4	25	29.6	.1	Goldman and Rose 2019, 150
		Unusually large external width, granting a relatively rounded profile, along with one of the widest neck guards. Brim and neck guard both extensively marked with incised lines and punched patterns. The twisted rope pattern typical of many Montefortino helmets has been modified with incised lines to create faux braiding and the inward facing edge is framed with ogee molding capped by two rows of punched dots. The upper edge of the guard extension has 3 bands of lines, with the center band bears a woven hatch-work pattern framed within interlocking triangles. The rim's faux cable interrupted in the front of the helmet by a group of molded knots and toggles				

		which appear to imitate clasp pieces typically made of wood or bone. Four small rivets on the helmet's left side, but have no apparent function, suggesting a repair in this area.				
3B2	PW11-0030	21.2	19.8	24.3	--	Goldman and Rose 2019, 152
		This helmet is intact, but heavily encrusted and the shortest of the assemblage. Braided cable decoration on rim, but without additional incised lines of **3B1**. The crest-knob has scaled patterns incised on side, and on top a poorly preserved image of a disk with 16 lines forming 8 rays or wheel-spokes. Based on other known examples, this is likely a poorly made rosette. Also incised in this design is graffito which could be a Punic "H" or Celto-Iberian "E".				
3B3	PW11-0031	26	23.8	27.3	.2	Goldman and Rose 2019, 152
		Very damaged helmet, missing c. 45% of its bowl on right side. Among larger helmets in both height and length. Braided rope decoration is particularly thick on this specimen, with two sets of ogee molding. The upper molding is crested by three fluted horizontal bands. Of the four bands on neck guard, all except outermost bear the same hatch-work in a triangle pattern and toggle decoration as **3B1**. Crest-knob has scale-patterned sides and a rosette on top.				
3B4	PW11-0032	27.1	23.1	27.2	--	Rose 2017; Goldman and Rose 2019
		A complete helmet almost fully encrusted upon recovery. One of two tallest helmets, and also one of the widest. Exterior decoration is very similar to **3B1**, with the same brim and neck-guard ornamentation.				
3B5	PW12-0012	27.1	20.4	24.4	.22	Goldman and Rose 2019
		One of two tallest helmets with **3B5**; missing almost half its bowl; large left side break. Brim's braided cable motif has abnormally long and angled "twists" which are punched instead of incised. Interior edge of the braid is marked by a line of large punched dots; interrupted at the front by a hole with remnants of a rivet post. Above the punched dots are two raised horizontal bands with a small flute between them and capped by a sharply incised line. Neck guard is marked with three simple lines.				
3B6	PW13-0004	22.8[248]	19.5	25.5	.64	Goldman and Rose 2019, 155
		One of the smallest helmets, this specimen was recovered almost fully encrusted but mostly intact, with two moderately sized holes punched through the dome. The particularly dense encrustation on this example made observations of surface detail difficult. The braiding is similarly loose to **3B5**. bands like those on **3B5** are visible around the rim and neck guard, although in the latter area some hatching is present. Underside of the neck guard has an almost fully intact chin strap attachment.[249]				

[248] est. original height c. 24 cm.; Goldman and Rose 2019, 149
[249] Goldman and Rose 2019, 155

3B7	Favignana Museum Helmet	--	--	--	--	Goldman and Rose 2019
		Recovered by fisherman and gifted to Favignana Mueum, where it is on closed display; helmet was not available for measurement and close inspection. Helmet missing almost half its dome, with majority of right side missing. Its brim cable is identical to **3B1**, **3B3**, and **3B4** along with the interior moulding and raised band. It bears a crudely made toggle group at its front. The neck guard has the typical incised lines with a central band of hatching. The crest knob has two rows of scales, and a rosette on top.				

3C. ***Cheek-Pieces and Hinge***

While none of the Montefortino helmets were found to retain their original bronze cheek-pieces (Greek *paragnatid*), their presence is known from other examples of this type.[250] Two cheekpieces and a cheekpiece hinge were discovered in the interior of Egadi Ram 6, all in a disarticulated state.[251] These cheekpieces are known to have three forward-faced projections,[252] or "cusps", which protected cranial elements like the cheek and jawbones without obstructing the wearer's peripheral vision.

[250] Rose 2017.
[251] Tusa and Royal 2012.
[252] Paddock 1993.

3C1-2. Montefortino Cheekpieces

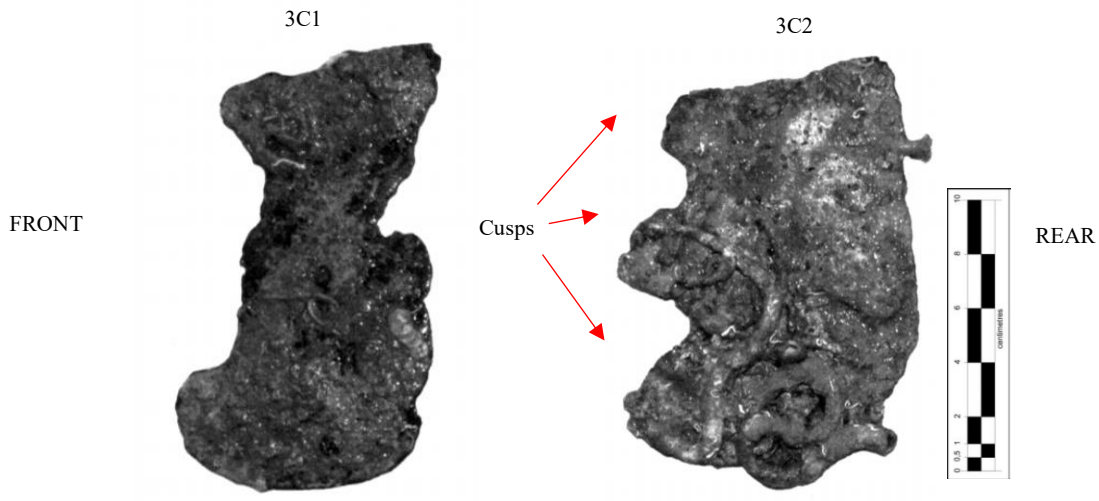


Figure 2.15: Egadi cheekpieces (After Goldman and Rose 2019)

ID	Exc. ID	H	W	Th	Source
3C1	PW11-034-001	13	pW 6	.1-.2	Goldman and Rose 2019
		Left-sided cheek-piece with only lower cusp preserved; middle and upper cusps and all of rear edge eroded away. Can be identified as coming from the left side by the truncated remains of the hasps on the piece's upper edge. Comments on surface features limited because, as of 2019 publication, piece had not undergone cleaning. Surviving portion slightly thicker in center and thinning around edges. Preserved lower cusp has a rounded edge. Chin-strap fixture on the interior lower edge of the cheekpiece missing.			
3C2	PW11-034-002	15	c. 8	.1-.2	Goldman and Rose 2019, 169
		Second bronze cheek-piece, also left-sided. Has not been cleaned or conserved, limiting interpretations of surface features like attachments. While also roughly bicuspid, with the bottom and middle extensions well preserved, there also remains the truncated base of the uppermost cusp, which unlike the others has a flat top where it joined the helmet. Almost fully preserved, only showing small chips along its edges, most notably on the middle cusp. Due in part to this degree of preservation, it has larger dimensions than **3C1.**[253] The lower cusp is rounded, while the middle cusp has a rounded top but a straighter edge along its bottom. This shape could be partially due to the erosion around its edges. Upper edge of the cheek-piece as a whole has been hammered inward. Two projections at either end create interior loops for a hinge to pass through. Chin-strap fixture is absent.			

[253] Measurements taken at top and bottom.

3C3. Montefortino Cheekpiece Hinge

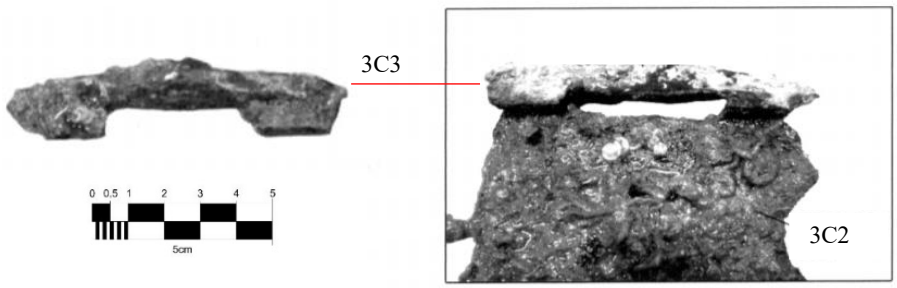


Figure 2.16: Egadi Cheekpiece hinge (After Goldman and Rose 2019)

Exc. ID	*L*	*Ring Inner Diam*	*Source*
PW11-034-003	c. 11	.4-.5	Goldman and Rose 2019

Solitary bronze hinge attachment, likely the upper extremity of a cheek piece broken off where inward-hammered extensions create the hinge channel. Its highly fragmentary nature prevents identification of which side of the helmet it is from. The shape is a flattened bar with two flat projections on each end. At top and center of this hinge, on the exterior face opposing the projections, there are the remains of a ring projecting upwards. Ring is interpreted by Goldman and Rose as possibly being used to attach the hinge to the side of the helmet and granting mobility to the cheek-piece.[254]

[254] It is difficult to interpret Goldman and Rose's explanation of this piece's function as the hinge would have already fulfilled this role, Goldman and Rose may have thought this piece was separate from the *paragnatid* itself.

3D1. Punic Helmet

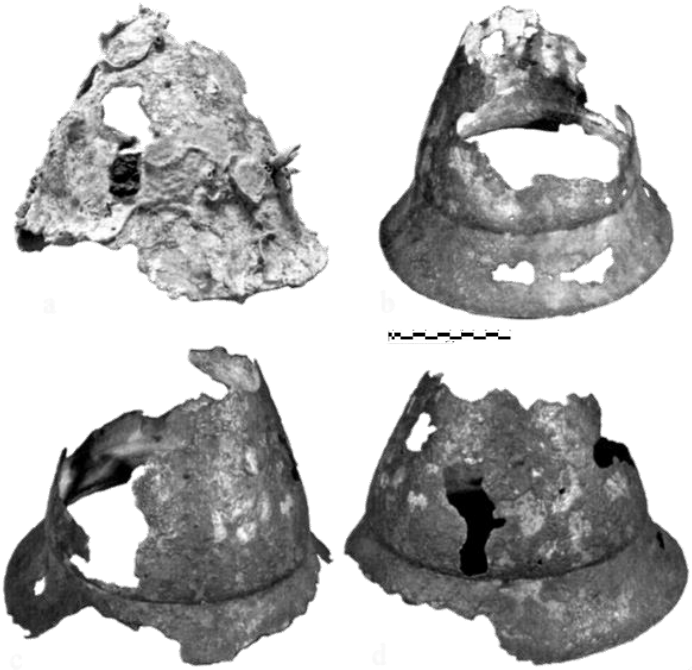


Figure 2.17: Egadi Punic helmet (After Goldman and Rose 2019)

Exc. ID	*H*	*W*	*Th (bowl)*	*Diam (w/ brim)*	*Th. (brim)*
PW12-0012	pH 20.7 [255]	24.8	.25	49.4	.1-.2 at edges; 4 at center
Sources	Goldman and Rose 2019, 171				

Sole non-Montefortino helmet at site. Bronze helmet was recovered in a heavily encrusted and badly damaged condition, missing the entire upper portion of the bowl and most of one side in a series of both large and small breaks. Large, conical bowl and a broad, sloping brim reminiscent of the Greek *pîlos*. The helmet was made from a single sheet of bronze. The bowl itself is moderately thin; The top is conical and tapers slightly inwards at the highest preserved point, while its lower end is slightly bulbous above an indented waist where it meets the brim (which is also marked by a narrow horizontal groove). The brim is preserved around slightly more than half the circumference of the bowl. Only evidence for rivets/attachments are two small holes side-by-side on lower bowl just above brim. No apparent decoration on the helmet or means of identifying which face was the front.

[255] est. original height c. 28 cm.; Goldman and Rose 2019, 171.

3E. Y-Shaped Montefortino Helmet Crest Mounts

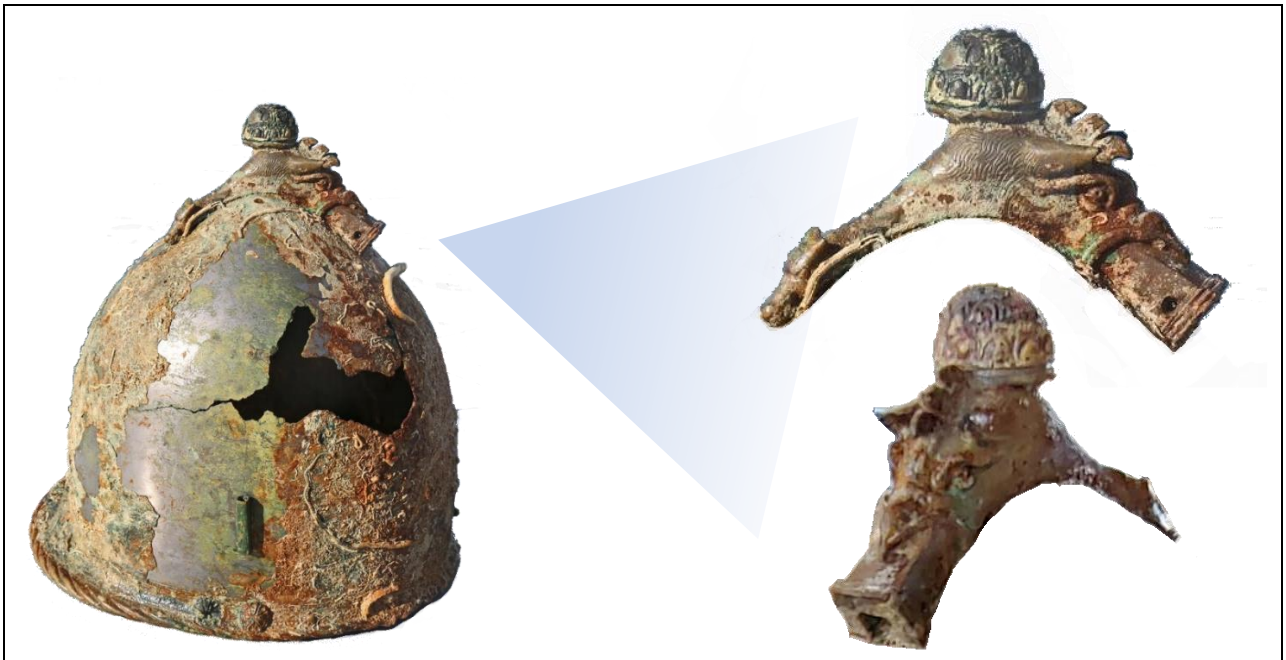


Figure 2.18: Egadi Helmet crest mounts (After Georgopoulos 2019)

Exc. ID	*Types*	*Sources*
N/A	Griffin, Lion, Undecorated	News Articles[256]; Personal Experience

Several recent Montefortino helmets have Y-shaped attachments on their crest towers. The base of the Y faces the front of the helmet and is hollow. Some are decorated (in the form of griffin/boar heads) while others are not. The operating theory[257] is that these accepted an additional crosspiece which held feathers. However, this last element was likely ceremonial and not used during battle, which might explain why none has been found on-site.

Additional/Ongoing Finds

Unlike the other sites discussed in this catalog, the Egadi Islands Project is an ongoing survey and recovery project. As such, the number of arms and armor currently published is likely not representative of the potential total figures from the site. Media coverage regularly reports on

[256] Georgopoulos 2019.
[257] as of 2019, personal experience.

new helmet finds from the site, which occur on an almost annual basis (Fig. 2.19). There have also been a number of disarticulated cheek pieces discovered at the site. While not enough of the components remain to conduct a thorough typological analysis, they largely fit the variants associated with Paddock Type VI-VII helmets.[258]

As with the helmets, more cheek-pieces and hinges have been discovered since the examples included here were studied and published. As an active, ongoing project on a large battle site, the numbers of all these finds is likely to continue increasing for the foreseeable future.[259]

Figure 2.19: Additional Egadi helmets (After Emma Salvo 2017)

4. Giglio Shipwreck (aka Giglio Campese A), Italy – c 580 B.C.E.

The Giglio Wreck is located off the northwest coast of the Tuscan island of Giglio. The site was discovered during the late 1950s or early 1960s but was the victim of looting in the years

[258] Paddock 1993; Goldman and Rose, 2019, 166.
[259] Should the reader wish to remain current on these discoveries, he or she should refer to the RPM Nautical webpage. RPM Nautical produces intermittent site reports and Sicilian media covers the site regularly.

immediately following. While Mensun Bound and Reg Vallintine bemoan this fact and state that in its original condition "it would have been one of the most important finds to have come down to us from all antiquity,"[260] it remains an important site with a number of important artifacts. The wreck was located in 50 m of water at the base of a reef. Bound and Vallintine[261] reference a work by Giulio Schmiedt[262] which outlines a steady rise in the Tyrrhenian Sea's level since antiquity. According to this publication, during the Etruscan period this reef would certainly have been very near the surface, making it a significant threat to ships' safety.

4A1. Bronze Arrowheads

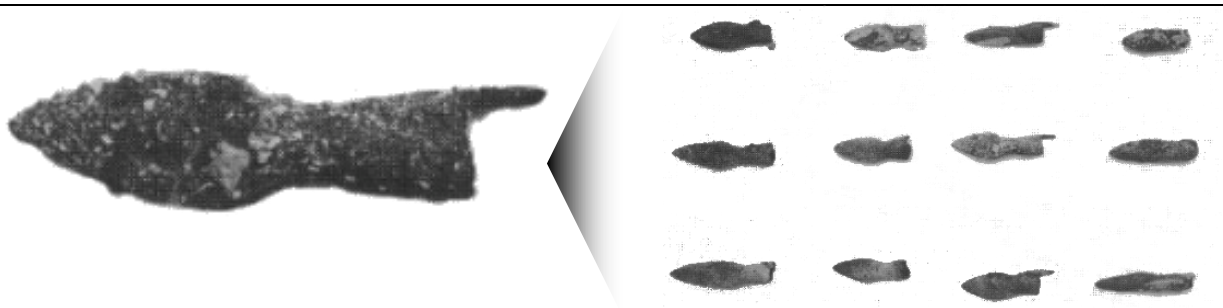


Figure 2.20: Giglio arrowheads (After Bound 1991).

ID	*Exc. ID*	*Dimensions*	*Source*
4A1	N/A	N/A	Bound 1991, 25
		Thirty socketed bronze arrowheads discovered during excavations. While all were mold-cast, they can be separated into two divisions; two-sided and three-sided. With the exception of one example, all possessed a barb/spur on one side. Due to variety in arrowheads' size and proportions, which would have required a number of different molds, Bound has interpreted these as part of the crew's equipment rather than the ship's cargo.	

[260] Bound and Vallentine 1983, 113.
[261] Bound and Vallentine 1983, 113.
[262] Schmiedt 1972.

4B1. Bronze Helmet

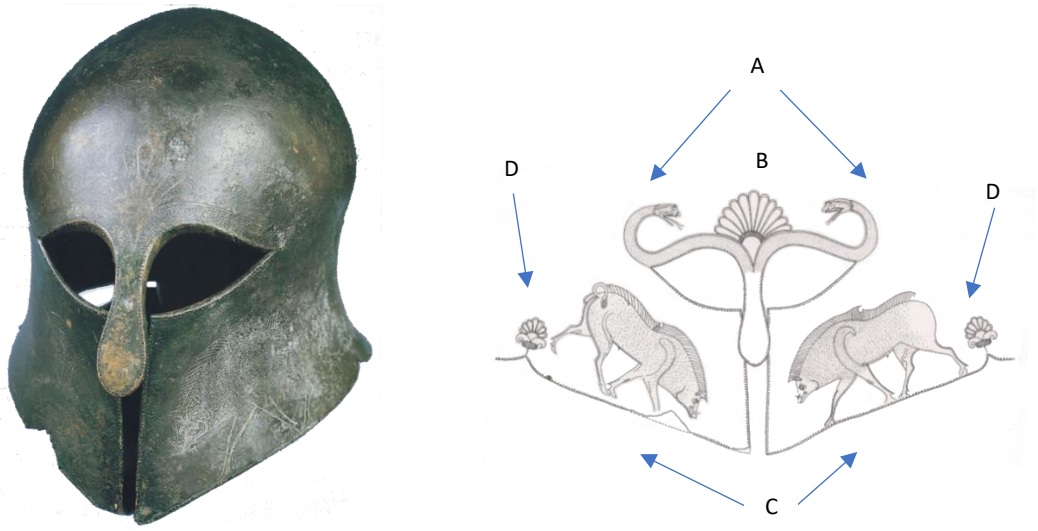


Figure 2.21: Giglio Corinthian helmet (After Bound 1991).

ID	*Exc. ID*	H	*W*	*Th (front)*	*Th (rear)*	*Source*
4B1	Priv. Collection	22.3	22	.11	.01 (or less)	Bound 1991, 9
		Corinthian type helmet hammered from a single bronze sheet; represents a high level of technical and artistic skill.[263] . Boars on either cheek-piece face each other with their heads down in an aggressive posture (C). The top of the nose piece turns into two hissing, open-mouthed snakes (A) which form the helmet's brows. The space in between is adorned with a palmette (B). Smaller palmettes adorn the edge of the rim behind either boar (D).				

4B2. Nose-guard of a Bronze Helmet

No Image			
ID	*Exc. ID*	*Dimensions*	*Source*
4B2	N/A	N/A	Bound 1991, 25
		Significantly less information on the second helmet, likely due to how little remained at the site. The only element was a nosepiece found near the ship's keel. It appears to have come from a helmet of significantly lower quality production, as it broke off where it was riveted to main body of the helmet. This means, unlike the intact helmet, this example was not made from a single piece of metal. The conclusion of Bound is that the rest of the helmet was scavenged from the site by looters during the 1960s.	

[263] Bound 1991, 9.

5. Kyrenia Shipwreck (Kyrenia, Cyprus) – 295-285 B.C.E.

Discovered in 1965 by a local Cypriot diver in 27 meters of water on an area of flat sandy seafloor off the north coast of Cyprus, the Kyrenia shipwreck was excavated from 1969-1972.[264] However, research on the vessel and its related artifacts has extended far beyond these dates. This is largely due to its incredibly well-preserved hull, which has served as a crucial source of information on ancient ship construction. On the basis of various dating sources from like radiocarbon analysis, numismatics, and amphorae, it is believed that the Kyrenia ship was built c. 325-315 B.C.E., and sank c. 295-285 B.C.E..[265] Eight light javelin heads of iron were found within lumps of concretion. The iron had largely rusted away, but casting and rubber replicas allowed analysis of their dimensions. However, the castings do not represent their original weight. Weapons were found embedded in the exterior of the ship's well-preserved hull. Several examples had pieces of the hull's lead-sheathing concreted to them. This discovery, in addition to a curse tablet found on site,[266] has been used as evidence that the ship was the victim of a pirate attack.

[264] Parker 1992, 232.
[265] Katzev 2005, 73.
[266] Katzev 2007, 291.

5A1-8. Iron Javelin-heads

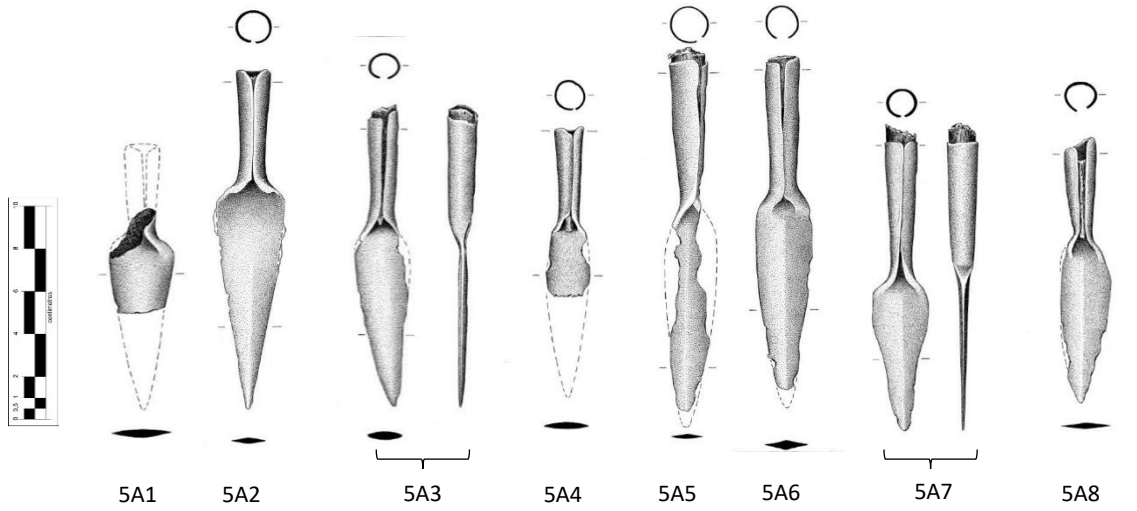


Figure 2.22: Kyrenia javelins artifact drawings[267] (Drawings courtesy of S.W. Katzev).

ID	*Exc. ID*	*L*	*W*	*Source*
5A1	Fe37	pL approx. 4.8	3	Katzev 1982, 28; Katzev 2007
		30% preserved iron javelin head; around socket and blade join. Flat metal bent into conical shaft socket		
5A2	Fe38	16	3.5	Katzev 1982, 28; Katzev 2007
		Fully preserved iron javelin head; slight corrosion of blade edges. socket made of flat metal bent in slightly conical, cylindrical shaft socket. Flat triangular blade, rounded corners at base and slight longitudinal crease (from bending).		
5A3	Fe39	13.9	pW 2.2	Katzev 1982, 28; Katzev 2007
		Almost fully preserved (95%) javelin head, slightly warped. Flat, narrow triangular blade, one corner corroded away. Socket made of metal folded into slightly conical cylinder. Wood fragment in socket		
5A4	Fe40	pL 8	pW 2	Katzev 1982, 28; Katzev 2007
		Iron javelin head, 50% of blade missing. Socket made of metal folded into slightly conical cylinder.		
5A5	Fe41	pL 16.5	pW 1.9	Katzev 1982, 28; Katzev 2007
		Iron javelin head, heavily corroded blade. Socket made of metal folded into slightly conical cylinder. Wood fragment in socket Reconstruction suggests narrow blade. Overall length larger than other examples.		
5A6	Fe42	pL approx. 15.7	pW 2.6	Katzev 1982, 28; Katzev 2007

[267] Used for measuring dimensions and calculating preserved percentages.

		Well preserved iron javelin head. Light corrosion around blade edges, point. Flat narrow triangular blade, rounded corners at base and slight longitudinal crease (from bending). Socket made of metal folded into slightly conical cylinder. Wood fragment in socket		
5A7	Fe43	13.5	2.4	Katzev 1982, 28; Katzev 2007
		Fully preserved iron javelin head. Slight warping, corrosion of blade edges. Flat, narrow triangular blade. Shorter and broader than other examples. Socket made of metal folded into slightly conical cylinder. Wood fragment in socket		
5A8	Fe44	12.3	2.2	Katzev 1982, 28; Katzev 2007
		Iron javelin head. Flat triangular blade, rounded corners at base and slight longitudinal crease (from bending). Sides slightly convex. Wood fragment in socket		

6. Terrasini Wreck (Terrasini, Sicily) – 300-200 B.C.E.

Terrasini locals and Italian academics were aware for many years of the remains of an ancient shipwreck, only three meters deep and less than 150 meters from the sandy Ciuccia beach in Terrasini, Italy.[268] However, as most of it was buried in the sand, archaeologists were dissuaded from excavating the site. This changed with the construction of breakwaters at the small fishing port of Terrasini, which changed local currents and resulted in the exposure of large portions of the ancient wreck. Between 1963 and 1966, many parties participated in recovering archaeological material, including many local fishermen and divers. Subsequently, some of the retrieved artifacts were dispersed or destroyed.[269]

[268] Purpura 1974, 45.
[269] Purpura 1974, 45.

6A1. Iron Sword

Figure 2.23: Terrasini Sword 1 (After Giustolisi 1975).

ID	*Exc. ID*	*L*	*W*	*Source*
6A1	Inv. no. 339	Approx. 58[270]	Approx. 7	Giustolisi 1975, 35
		Originally heavily concreted. Conservation revealed an iron blade (tip missing) contained within a wooden sheath with a leather covering. Much of the handle was lost, but the hilt pommel was preserved within the concretion.		

6A2. Iron Sword

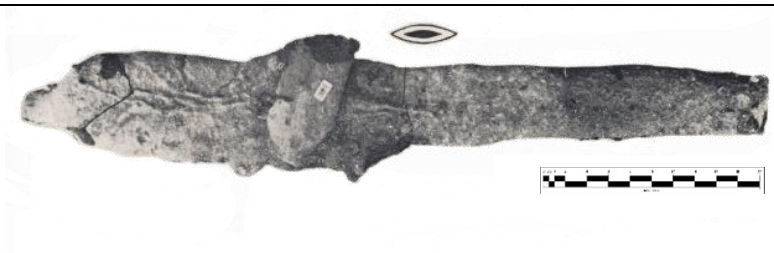


Figure 2.24: Terrasini Sword 2 (After Giustolisi 1975).

ID	*Exc. ID*	*L*	*W*	*Source*
6A2	Inv. no. 340	Approx. 70	Approx. 12[271]	Giustolisi 1975, 35
		Sword not conserved, left within its covering of limestone concretion. Part of the handle is still preserved/visible. Tip of the blade is lost, but this is a modern break resulting from an attempt to remove the concretion. Exposed section revealed a two-edged blade with a biconvex profile.		

[270] All measurements for Terrasini artifacts were estimated using in-image scale bar, but not explicitly stated in publication.
[271] It likely still includes some concretion.

6B1. Stone Projectile

Figure 2.25: Terrasini stone projectile (After Giustolisi 1975).

ID	*Exc. ID*	*Diam.*	*Source*
6B1	inv. no. 224	40	Giustolisi 1975, 36
		Spherical stone object; identified as a probable catapult projectile. Simple and lacks distinguishing marks, make it impossible to date. Large dimensions raise questions of means of propulsion; merchant ship would not have had catapult(s).	

7. Heraclea Minor/Minoa (Agrigento, Sicily) – 270-250 B.C.E.

The harbor of Heraclea Minoa is known to have been an important Carthaginian naval base during the First Punic War. It was here that the Carthaginian navy anchored prior to the Battle of Ecnomus (256 B.C.E.), and where the fleet was stationed while launching raids against the Roman blockade of Lilybaeum. A shipwreck was discovered at this location. Unfortunately, the site from which this artifact came is unpublished.[272] Therefore we are unaware if additional material has been discovered, namely rams and other armament, which might indicate the presence of an ancient fleet. Paddock acquired and recorded the dating of the wreck and descriptions of the helmets general appearance and decoration without detailed context for the wreck as a whole.[273]

[272] Paddock 1993, 546, 548.
[273] Paddock 1993.

7A1-4. Bronze Helmets

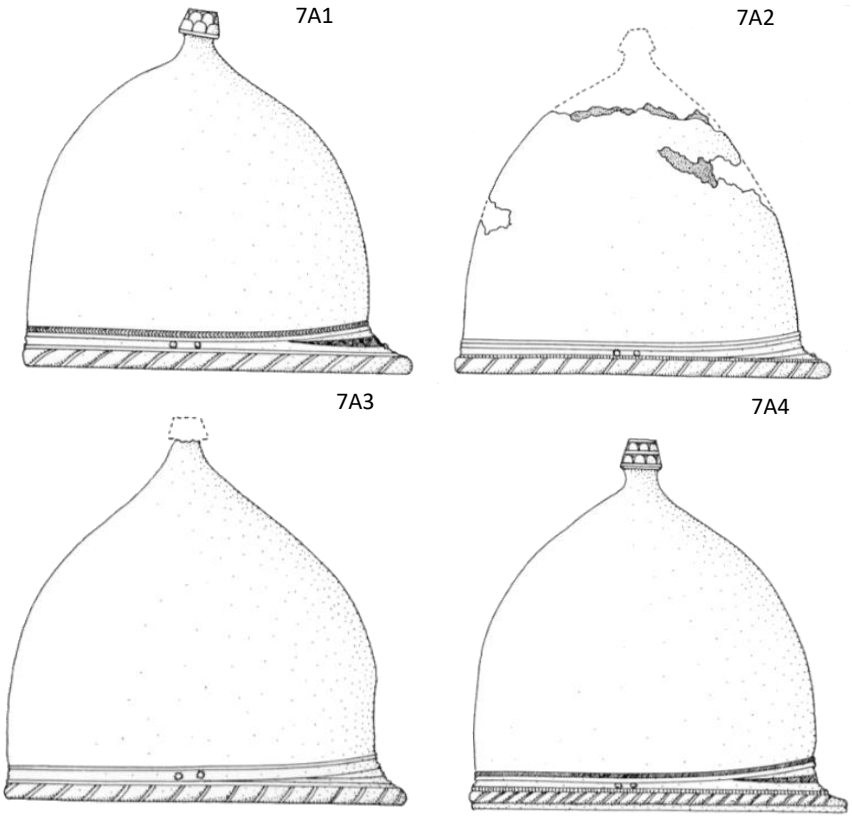


Figure 2.26: Heraclea Minor Montefortino helmets (After Paddock 1993).

ID	*Exc. ID*	*Dimensions*	*Source*
7A1	MNA C1648	Unpublished	Paddock 1993
		Fully preserved Montefortino helmet. Thick rim with oblique incised lines forming "twisted-rope" pattern. Plain molding around rim surmounted by a narrow molding, a broader ogee molding and three more narrow moldings. Apex crest knob has 'acorn'/'scale' pattern on sides. Dome made of thin sheet metal	
7A2	MNA C1651	Unpublished	Paddock 1993
		Montefortino helmet. Bottom half well preserved; Thick rim with incised cable pattern surmounted by a narrow molding, a broad ogee moulding, and another narrow moulding. Top half exhibits significant damage. Dome made of thin sheet metal	
7A3	MNA C1649	Unpublished	Paddock 1993
		Almost fully-preserved Montefortino helmet. Thick cable pattern around rim below a narrow moulding; broader ogee molding and additional two narrow mouldings. Crest knob broken off. Dome made of thin sheet metal	

7A4	MNA C1650	Unpublished	Paddock 1993
		Fully preserved Montefortino helmet. Thick rim with closely-space incised cable pattern around rim surmounted by a narrow moulding, a broader ogee moulding, and three more narrow mouldings. Crest knob decorated with 'acorn' pattern around truncated conical shape. Dome made of thin sheet metal	

8. Isla Pedrosa Shipwreck (Isla Pedrosa, Spain) – 150-140 B.C.E.

This site was discovered by coral divers in the early 1950s. Word eventually made its way to the Catalan diver's club CRIS, and a team led by Federico Foerster excavated the wreck from 1959 to 1970.[274] The Roman shipwreck is located near Gerona, between two submerged reefs 300 meters southeast of the island from which it gets its name (depth: 36-40 m). Coins from Naples and Massalia, along with Campanian A ceramic wares provide a fairly precise sinking date between 150 and 140 B.C.E.[275] The cargo included almost 200 lava millstones (< 100 pairs) and the aforementioned Campanian ware. Within this assemblage were several concretions containing the remains of iron knife-blades.[276]

It is impossible to tell if these knives possessed handles, were crew equipment for utility or defense, or were unattached blades that were simply another category of cargo presumably intended for trade or sale.

[274] Parker 1992, 217.
[275] Morel 1981; Foerster et al. 1975.
[276] Placed in Medium Assemblages as use of word "several" suggests MNI = 3.

8A1. Iron Knives/Daggers

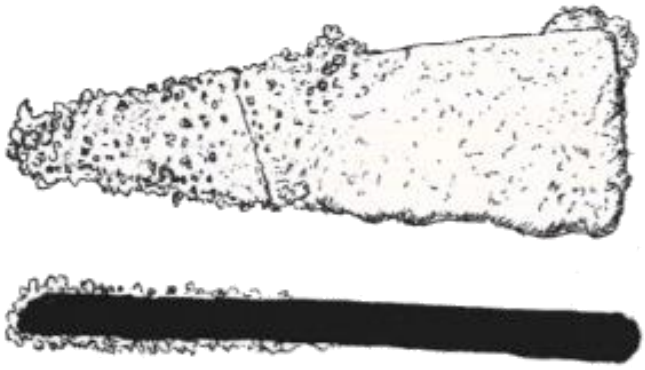


Figure 2.27: Isla Pedrosa Knife Concretions (After Foerster et al. 1975).

ID	*Exc. ID*	*Dimensions*	*Source*
8A1	N/A	N/A	Foerster et al. 1975, 106
		Post-excavation conservation work resulted in casts of points of probable knife[277] blades from hollows in ferrous concretion.[278] Specific number of these concretions not specified in any excavation reports.	

9. Spargi Shipwreck (Maddalena Islands, Sardinia) – 120-100 B.C.E.

The Spargi shipwreck is in the Maddalena Islands near Sardinia. The vessel is dated to 120-100 B.C.E., and may have been approximately 35 m long. Its lead-sheathed hull was partially preserved, and the ship was loaded with wine amphoras, pottery and furniture. The site lies in 15-18 m of water. It was discovered in 1957 and partially excavated by Nino Lamboglia (1958-59) before being looted.[279] The wreck was excavated again in the 1970s, a project that produced an impressive 400 amphoras, before more looting occurred. Following this, what remained of the

[277] knife is direct translation, dagger is probably more accurate given symmetrical point shape, suggesting two cutting edges.
[278] Foerster et al. 1975, 106.
[279] Parker 1992, 409.

site was reburied for its protection. Among the finds was a bronze helmet with a skull fragment adhered to its interior, raising the question of whether a confrontation had occurred.[280]

9A1. Iron Spearhead

Figure 2.28: Spargi spearhead (After Pallares 1986).

ID	*Exc. ID*	*Dimensions*	*Source*
9A1	N/A	N/A	Pallares 1986
		Ferrous spearhead; surface metal highly corroded but general shape preserved. Pistiliform shape with large cylindrical tang.	

9B1. Knife

No Image

ID	*Exc. ID*	*Dimensions*	*Source*
9B1	N/A	N/A	Parker 1992; Pallares 1986, 98
		Tentatively identified in Parker catalog and Pallares summary report (With a question mark). Likely ferrous, highly concreted/poorly preserved.	

[280] Gianfrotti 1981.

9C1. Fragmentary Bronze Helmet (with Skull)

Figure 2.29: Spargi fragmentary skull/helmet (After Pallares 1986).

ID	*Exc. ID*	*Dimensions*	*Source*
9C1	N/A	N/A	Gianfrotta & Pomey 1981; Pallares 1986
		Top half of a human cranium. Bronze helmet fragment not illustrated in published images, but presumably matches approximate coverage of retained bone fragments.	

9D1. Cuirass

No Image

ID	*Exc. ID*	*Dimensions*	*Source*
9D1	N/A	N/A	Parker 1992, 410; Pallares 1986, 98
		Parker comments that a cuirass was 'recently' found on site, but without specific citation. Pallares 1986, the most recent publication in Parker's catalog mentions no such artifact. Closest relevant excerpt from field reports is a quote reading "…among the ornamental or clothing materials the very small bronze studs are frequent, probably of seam or armor ornament, buckles and small rings, as well as larger bronze circular studs, which have the pin finished with a lead circle decorated in the upper part with engraved ovule motifs."[281] This suggests minor components of possible armor discovered prior to definite evidence cited by Parker. No images provided.	

[281] Pallares 1986, 98.

10. Colonia de Sant Jordi A Shipwreck (Ses Salines, Mallorca) – 100 B.C.E.

This shipwreck was discovered on the coastal side of a reef, some 55 m from the eastern coastline of Majorca near Colonia de Sant Jordi (aka Ses Salines) in 4 m of water. It is one of several shipwrecks in the area uncovered by a storm, which led to excavations in 1977 to preempt looting . The site contained an incredible variety of cargo including Punic, Coan, and Cnidian amphoras. The cargo and hull construction have drawn comparisons to the Cavaliere shipwreck near the Island of Capri, Italy, with both being dated to or just after 100 B.C.E.[282] Where the two wrecks are said to differ is in the presence of metal tools on the Colonia de Sant Jordi A site, a category of find absent at Caviliere. Sant Jordi A has produced two iron knives and an iron axe, which was primarily utilitarian but could also have served as a weapon.

10A1. Iron Axe

Figure 2.30: Colonia de Sant Jordi axe (After Cerda 1980).

ID	*Exc. ID*	*L*	*W*	*Wt*	*Source*
10A1	N/A	21	8.5	1,830[283]	Cerda 1980, 89
		Axe blade in well-preserved condition. Significant restoration only required around the cutting edge. On opposite end of the axe head, there is an ellipsoidal shaft-hole. Part of the wooden shaft is still retained in this space, and appears to exhibit evidence of fire damage.			

[282] Cerda 1980, Colls 1987.

[283] Measurement was taken post-conservation, and likely does not fully reflect original weight. Same is true for the knives.

10B1. Iron Knife

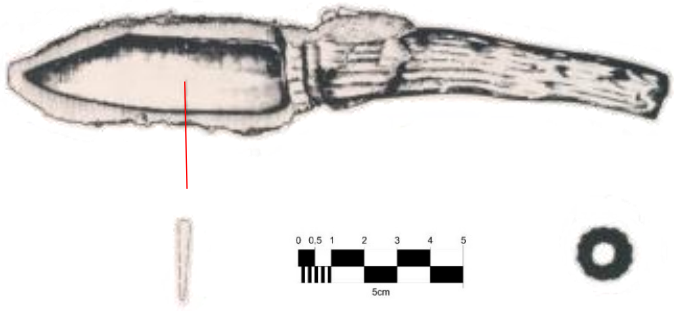


Figure 2.31: Smaller Colonia de Sant Jordi knife (After Cerda 1980).

ID	*Exc. ID*	*Tot. L*	*Blade L*	*Wt*	*Source*
10B1	N/A	11.7	7.9	90	Cerda 1980, 89, 90
		Iron knife with a handle made of deer antler. The blade only remained as a hollow within the calcareous concretion, the metal having completely corroded away. The same process occurred with the metal rings (not specified, but presumably also ferrous) that were used to secure the blade to the handle. Restoration made it possible to reconstruct the shape of the knife's blade. Weight measurements were taken upon receipt from the laboratory.[284]			

10B2. Iron Knife

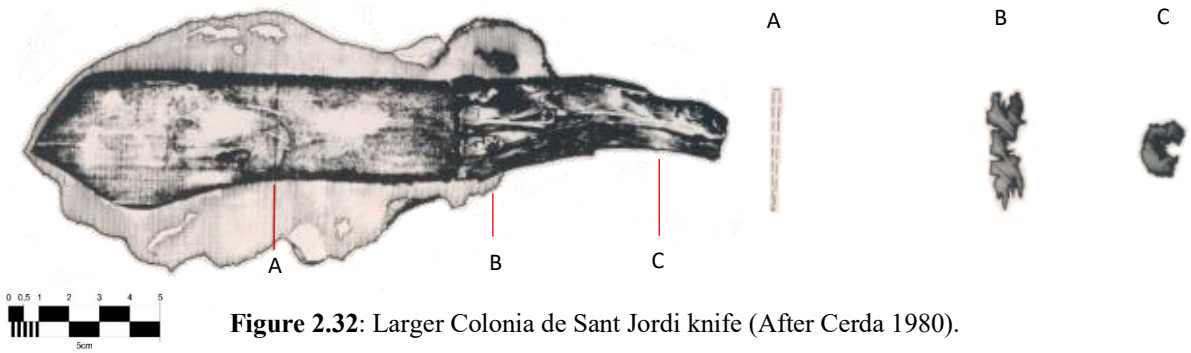


Figure 2.32: Larger Colonia de Sant Jordi knife (After Cerda 1980).

ID	*Exc. ID*	*Tot. L*	*Handle. L*	*Blade L*	*Blade W*	*Wt*	*Source*
10B2	N/A	22.8	9	13.8	Approx. 4.5	338	Cerda 1980, 89
		Second knife larger than **10B1**. While blade was also made of iron, handle was made of wood. Again, the metal blade had disappeared, leaving only the hollow imprint in the marine concretion to reconstruct its shape. The overall weight of the artifact is 338g (not specified if this measurement was taken before or after conservation, probably after based on other pieces).					

[284] Cerda 1980, 89; given the loss of metal this is not reflective of artifact's original weight.

11. Albenga Shipwreck (Albenga, Italy) – 100-80 B.C.E.

This site sits at a depth of 40-42 m between the historic and current mouths of the River Centa, about 1 km east of Albenga, Italy. It was known to local fishermen for many years, and was first worked on using salvage equipment in 1950. More methodical investigations were led by Nino Lamboglia from 1957 to the early 1970s, dating it to 100-80 B.C.E. The silty seafloor produced by river sediment preserved the large (30 m x 10 m) site, including organic material. The wood of the hull was found in impressive condition, but was not properly conserved. In terms of cargo, over 1200 amphorae of a much larger (but not firmly agreed upon) total number have been recovered from the site. These were predominately of the Dressel 1B type. Included in this remarkable collection were seven bronze helmets of various types. Excavation of the Albenga shipwreck was concluded in 1962.[285]

[285] Lamboglia 1964.

11A1-6. Bronze Helmets

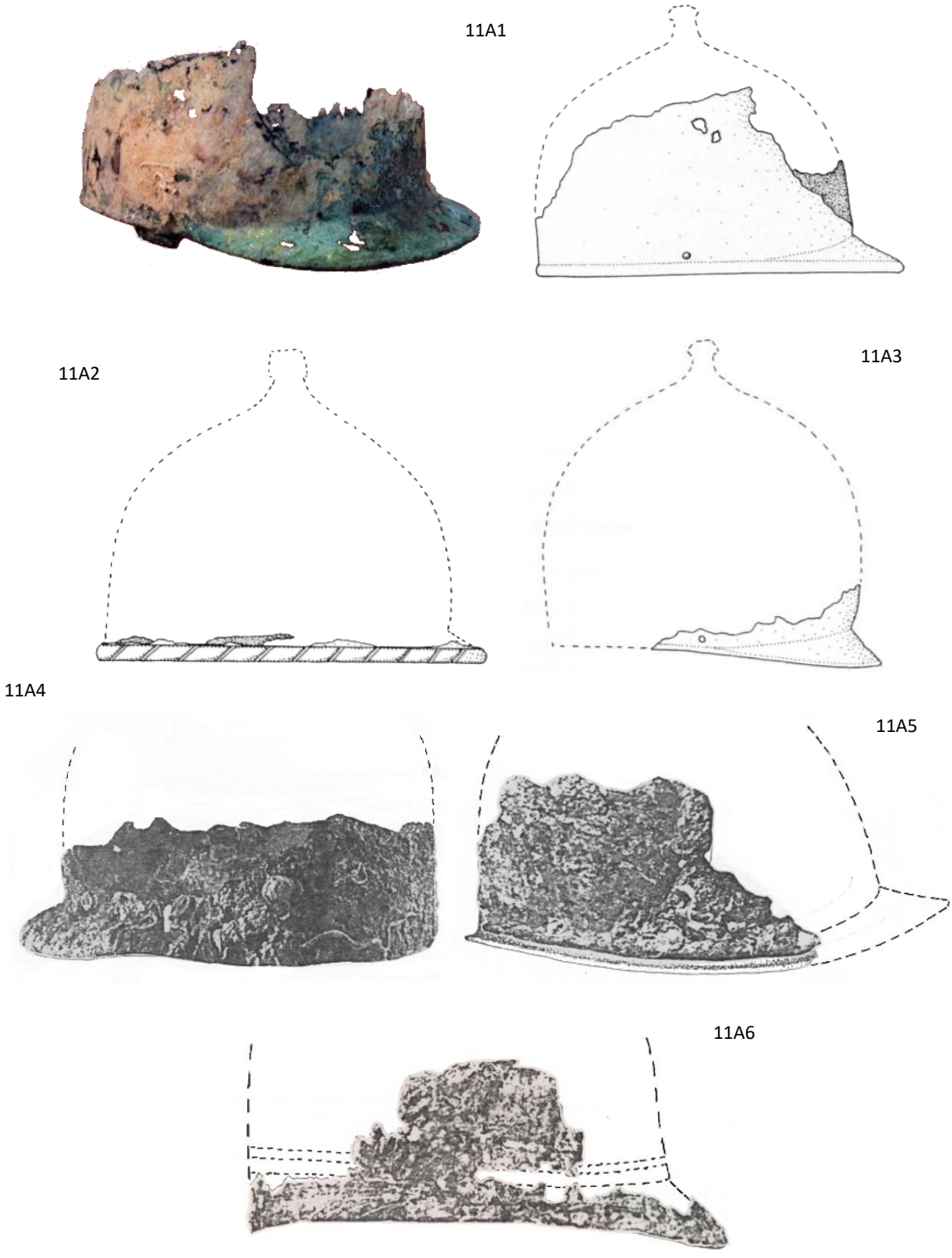


Figure 2.33: Albenga helmets "A-F" (After Pallares 1983; Paddock 1993).

ID	*Exc. ID*	*Diam*	*H*	*Source*
11A1	RNMA 413(A)	20	pH. 10.5	Couissin 1926; Pallares 1983
		Heavily damaged; top half of likely spherical cap not preserved. Further damage visible on the rest of the helmet down to the slightly flared, undecorated rim. The rear of this rim expands significantly at the back of the helmet to form a rounded neck guard, which is again undecorated. Left side retains hinge, attached to cap by two rivets, still equipped with tubule for fastening the cheek-piece. Pallares posits they were made of a perishable material, citing leather as likely option. On the neck guard, a hole present for attaching another adjustable element like a neck covering or simple or double ring for the hanging the helmet. Pallares attributes the helmet to a type defined by Paul Couissin as "Haguenau-type", dateable to first century B.C.E. This helmet type is best defined as a transitional style between the Montefortino helmet and the later Coolus, retaining higher crown and (initially) rounded button of former, with extended neck guard and riveted forehead visor of latter.		
11A2	RNMA 414(B)	Dimensions N/A		Lamboglia 1952; Paddock 1993
		Only the lower rim is preserved, barring small attached fragments of dome. Likely possessed spherical cap, with a severely limited neck guard; barely visible by widening of the rim. Decorated with a series of oblique incised lines forming “twisting rope” pattern, which join at center of the neck-guard, departing from it in opposing directions. No sign of hinges for the paragnatids. Despite extreme fragmentation, helmet associated with Roman Montefortino design in terms of form, with decoration continuing a pre-Roman motif/tradition.		
11A3	RNMA 415(C)	N/A		Lamboglia 1952; Paddock 1993
		Undecorated and heavily damaged. Only short neck-guard and immediately surrounding helmet metal preserved. Small rivet hole on left side of rim, just forward of neck-guard join. Very thin sheet metal and in the absence of any decoration.		
11A4	RNMA 416(D)	N/A		Lamboglia 1964
		Undecorated. Upper half of helmet dome missing. Concretion prevents observation of surface detail. Small curved neckguard projecting from rear.		
11A5	RNMA 417(E)	N/A		Lamboglia 1964
		Undecorated, small ridge along bottom rim. Left side preserved, to maximum of two-thirds maximum (est.) height. Shape suggests relatively wide neckguard; not preserved.		
11A6	RNMA 418(F)	N/A		Lamboglia 1964
		Narrow cable around the rim surmounted by three decorative bands including two rows of incised herring-bone pattern. Portion of dome left side preserved, majority of helmet missing. Pronounced neckguard slopes down, along with helmet rim.		

12. Cap Taillat (Cap Taillat, France) – c. 100 B.C.E.

The Cap Taillat shipwreck is actually located 600 m north of Cape Taillat itself in Bon Porte Bay. This has been a heavily trafficked waterway both historically and in the present, and that the wreck lies in only 33 m of water has sadly not saved it from extensive looting over the years. Thankfully, some artifacts from the wreck were studied and published before the site was stripped bare. Marked Dressel 1A amphorae helped date the site to c. 100 B.C.E.

12A1. Bronze Spearhead

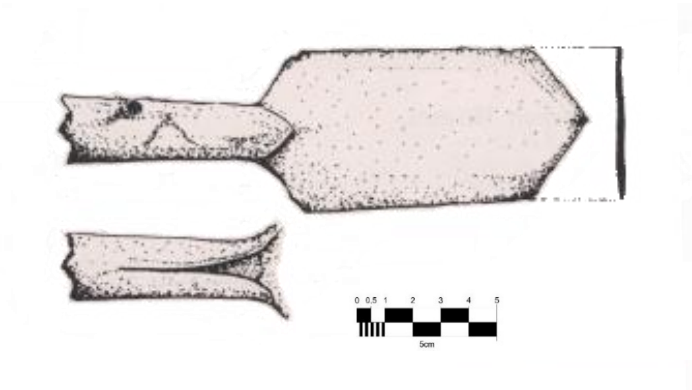


Figure 2.34: Cap Taillat spearhead (After Joncheray 1987).

ID	*Exc. ID*	*L*	*W*	*Th*	*Source*
12A1	N/A	11.8	5.8	0.7	Joncheray 1987
		Rather uniquely shaped, well preserved bronze spearhead, including entire tang including the housing for a nail (For attaching to a spear shaft). Spearhead shape is abnormal; point is broad and not tapered, maintaining similar width for much of its length.			

12B1. Ferrous (Short) Sword

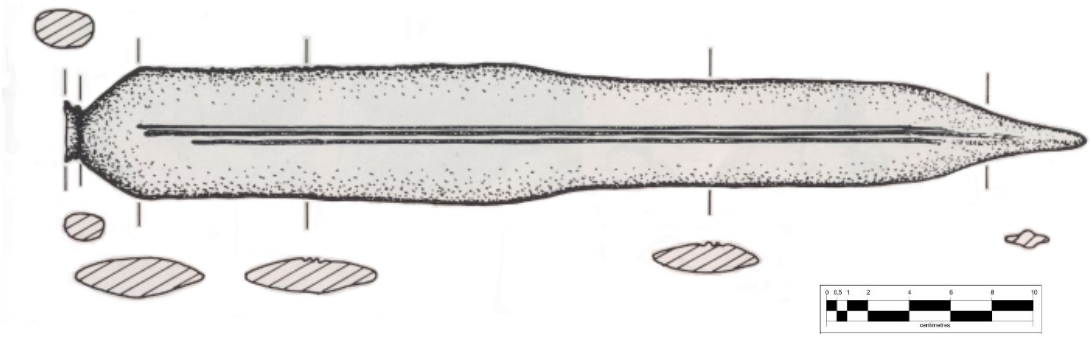


Figure 2.35: Cap Taillat sword reconstruction (After Joncheray 1987).

ID	*Exc. ID*	*L*	*W*	*Th.*	*Source*
	Exc. ID N/A	Approx. 49	Approx. 6.75	2	Joncheray 1987, 141
		A sword from the site entirely reconstructed from concretion void. the blade is long, with an almost stepped appearance in width along its length and a narrow point at its end. It has a compressed oval cross-section at all points. Its edges were blunted, and on the center of one side of the blade three grooves run most of its length. The tang for connecting the blade with a hilt was not preserved.			

12C1. Ferrous Axehead

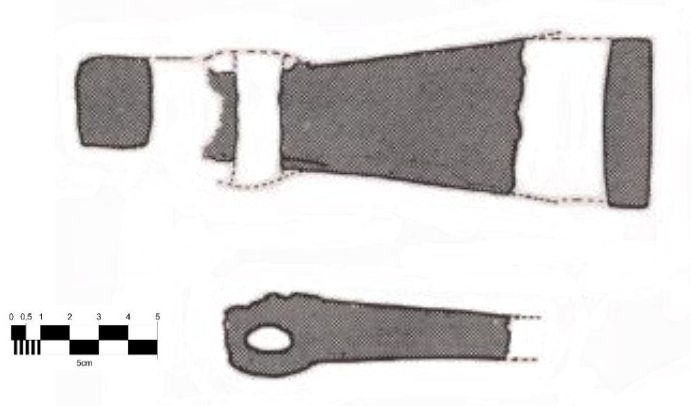


Figure 2.36: Cap Taillat axehead (After Joncheray 1987).

ID	*Exc. ID*	*Dimensions*	*W*	*H*	*Source*
	Exc. ID N/A	Max L. 23	5 (at socket)	10	Joncheray 1987
		Found adhered to a lead ingot from the ship's cargo. It was identified as an ax, but was heavily concreted and very degraded. Dimensions were estimated from reconstructions, not preserved portions. It is likely however, that this was a carpenter's tool and not explicitly military equipment.			

13. Valle Ponti (Comacchio, Italy) – 25-1 B.C.E.

The Valle Ponti wreck is near Comacchio on the Northeastern coast of Italy. It originally ran aground on a sandy beach, before it was covered and rising water levels left it 4 m below ground level at the bottom of a shallow channel. This was drained following the site's accidental discovery in 1980 to allow excavation to take place. The wreck was very well preserved, with various cargo and amphoras (Dressel 2-4, 6, Chian, etc.) as well as 1-2 counter-stamped lead ingots and a number of five-foot boxwood logs. Its well-preserved hull and cargo make it an important site both for ship construction and maritime trade investigations.

The sword was found toward the bow end of the wreck, in a living space with dice, gaming pieces, strigils (scrapers), and food warmers (*scaldivivande*).[286] Its distinct separation from the cargo is useful in identifying it as the property of the crew, likely the captain, and almost certainly for defensive purposes.

[286] Parker 1992; Berti 1990, 247.

13A1. Sword

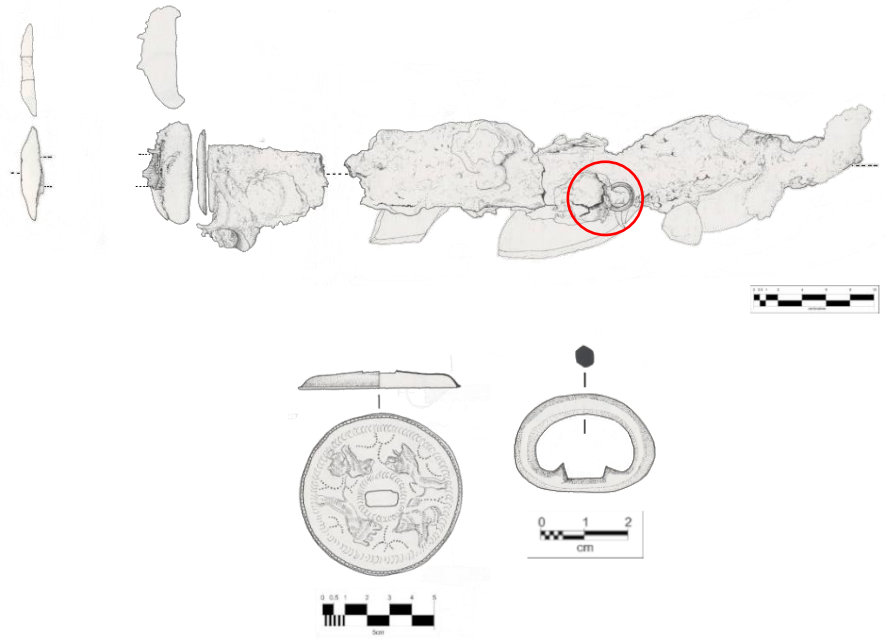


Figure 2.37: Comacchio sword and rings (After Berti 1990).

ID	*Report ID/Excavation ID*				*Source*		
13A1	227 and 228[287] (Buckle) / 59089, 59649-51, 59668, 59686				Berti 1990, 101, 258		
	Pommel Knob	*Handguard Knob*	*Handguard*	*Blade*	*1st Ring*	*2nd Ring*	*B. Ring*
H	--	3.5	0.6	--	--	--	3.2
L	2 (hole)	--	--	55	--	--	--
Diam	8	8.5	7.2	--	2.4	2.7	--
W	--	--	1.5x0.7 (hole)	--	--	--	4.6

Fragmented and poorly preserved sword. Decorated; circular handguard was placed at the bottom of the double-sided blade. Two wooden knobs; one reinforces the base of the blade and is partially hollowed for the hand guard, and another at the handle base. Three associated bronze rings; two rings - first still encrusted in the thick concretion that covers the object and second separate - were likely intended for the attachment of a lost scabbard. Third, larger, ring from belt.

Pommel knob is elm wood; piece is circular, flat on one side, and rounded on the other. In the center there is a narrow rectangular hole for the tang. Handle/hilt absent up to hand guard. Hand-guard knob is made of alder wood; knob is circular-section, and rounded on the end facing the hilt. The blade-facing end is hollowed out for the integrating decorated guard. A segment of the blades metal tang remains in the central hole. Handguard itself is disc shaped. Raised slanted rim and rectangular hole in the center for the tang; embossed dashes on the rim. On surface facing the

[287] In Berti 1990, thorough publication of project including catalog of principal artifact finds.

blade, there is a scene showing lions and bears facing each other in two pairs, with plant elements interspersed within. This tableau is framed on both the interior and exterior by circles of comma-shaped incisions.

General form of iron blade visible, presumably double-edged; state of preservation is so poor its exact original shape and dimensions cannot be definitively reconstructed. It is heavily encrusted along its length. Among the various concretions adhered to the blade is a circular bronze ring; another slightly larger bronze ring was found nearby; originally circular but flattened slightly in deposition, and has etching on the edge. Both likely from the system for suspending the sword or scabbard.

Larger buckle ring – likely from belt from which the sword would hang – was also cast bronze, semicircular and hexagonal in section, with small knobs at the base; no decoration

13B1. Dagger (& Scabbard)

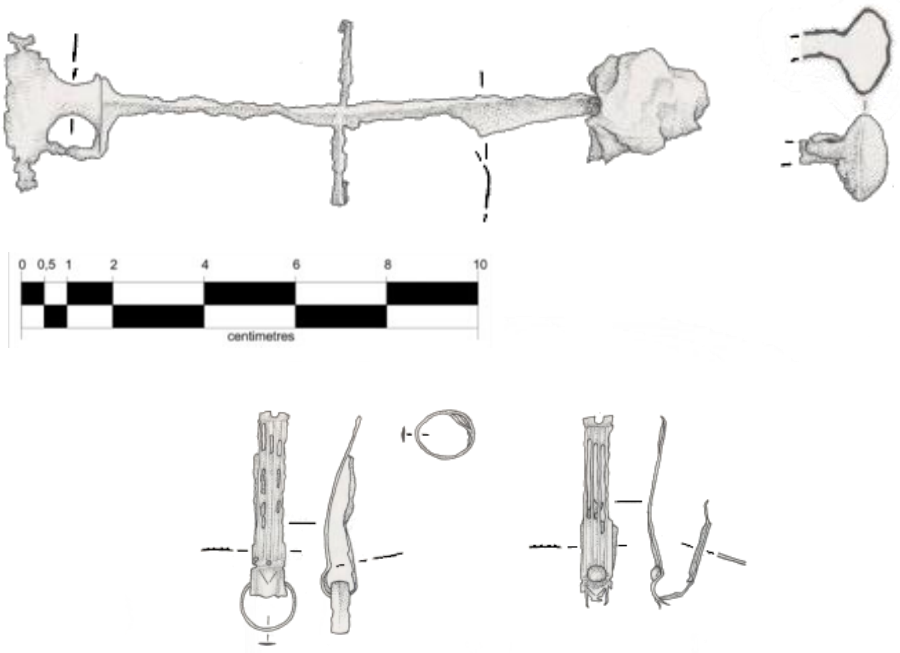


Figure 2.38: Commachio dagger scabbard components (After Berti 1990).

ID	*Report ID / Exc. ID*		*Source*
13B1	Cat. No. 229 (Exc. ID 59633)		Berti 1990, 261
	L	*W*	*Diam*
Metal Frame	15.5	4	1.8 (ferrule knob)
Decorative Clasps	6	--	1.5 (ring)

Overall rectangular in shape, most which is negative space. A central rib runs length, ending at the upper (base) end in a square section - with pelta hole - and at the tip in a vaguely triangular ferrule; ferrule capped by hollow, roughly ovoid knob. Near the rib's mid-point, two transversal branches diverge perpendicularly from either side. These have hooked ends.

In association; pair of thin rectangular bronze sheets which are folded back on themselves to create eyelets for holding suspension rings. One is smooth while other is decorated with four thin ridges.[288] In relief, the eyelet sections bear inverted V motif on their ends flanked by ridges running along the edges. Fixed to supports by nails.

13C1. Leather Vest

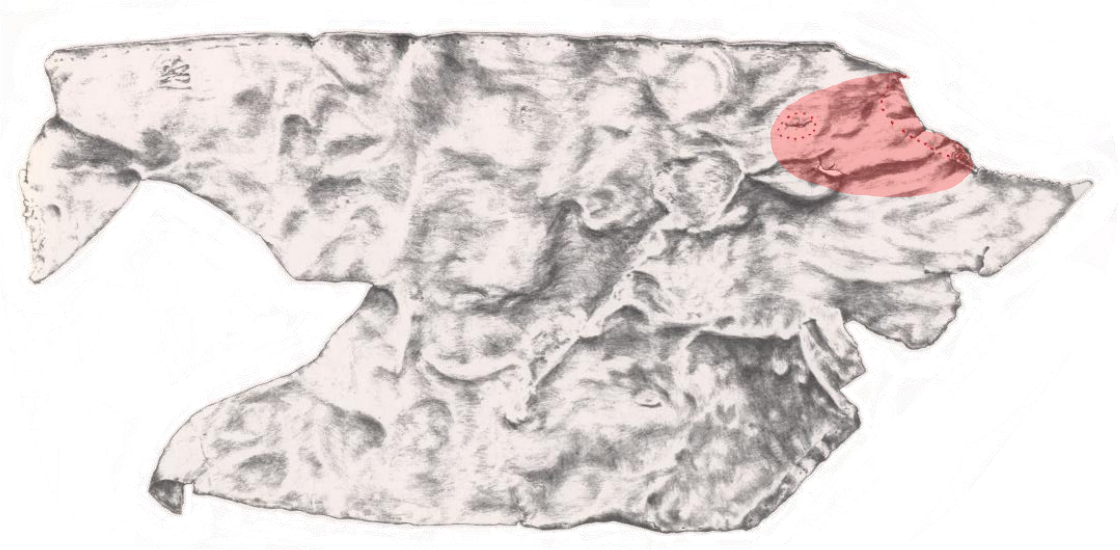


Figure 2.39: Commachio leather vest (After Berti 1990).

ID	*Report ID/Excavation ID*	*Dimensions*	*Source*
13C1	Cat. No. 154 (Exc. ID 56029)	N/A	Berti 1990, 87

Rare find of a leather torso garment. Leather is of high quality. Clothing remains are specifically proposed to be a vest of similar shape to shirts/jackets from military camp at Vindonissa. It would be worn day-to-day when the soldiers were not in armor.[289] The leather shows evidence of repairs in the form of stitching holes in small ovals or circles around cracks, presumably where patches were sewn onto the base fabric.

[288] Statement by author, but the image provided appears to show ridges on both.
[289] If it was worn under armor, the expectation would be that wear would occur in the same places.

14. Kefar Samir (Kefar Samir, Israel) – 14th-13th Centuries B.C.E.

Kefar Samir is located approximated 3 km south of Haifa, the site is spread out in an area 400x200 m, ranging from 1-5 m in depth. It is subsequently divided into two areas, North and South (both listed at coordinates 32' 47' N., 34" 57' E).[290] Part of the site is a submerged Neolithic settlement.

A merchantman was seemingly wrecked ashore, presumably by a storm surge.[291] There are no preserved hull structures. However, heavier pieces of the ship's cargo settled on a clay substratum on the seafloor and were preserved by a layer of sand. Eight tin bar ingots were found in poor preservation with highly eroded and illegible script on one. There were also two additional hemispherical tin ingots, one of which was sawn or cut in half in antiquity. Another set of five smaller lead ingots bear incised marks on their convex side. Nearby, about 100 m offshore in 3 m of water was a group of five stone anchors, all of similar size. They are semicircular in shape with a hole drilled from both directions through the rounded ens. On one of these there is a carved shape interpreted by Raban and Galili to possibly be either a turtle or scarab.[292] Stylistic dating work focused primarily on the anchors – one of which bore an Egyptian hieroglyphic - suggests a date of 14-13th century B.C.E. for the assemblage. A likely point of origin somewhere along the Nile was posited on the grounds of the aforementioned marked anchor, an Egyptian plaque, and sickle-sword found 5 m from the anchors.[293] It is possible there were other bronze artifacts present at the site and perhaps even more weapons, but its shallow depth left the site vulnerable to storms and looters in the 1960s

[290] Parker 1992, 225; Raban and Galili 1985.
[291] Raban and Galili 1985, 326.
[292] Raban and Galili 1985, 327.
[293] Raban and Galili 1985, 327.

14A1. Bronze 'Khepesh' Sword

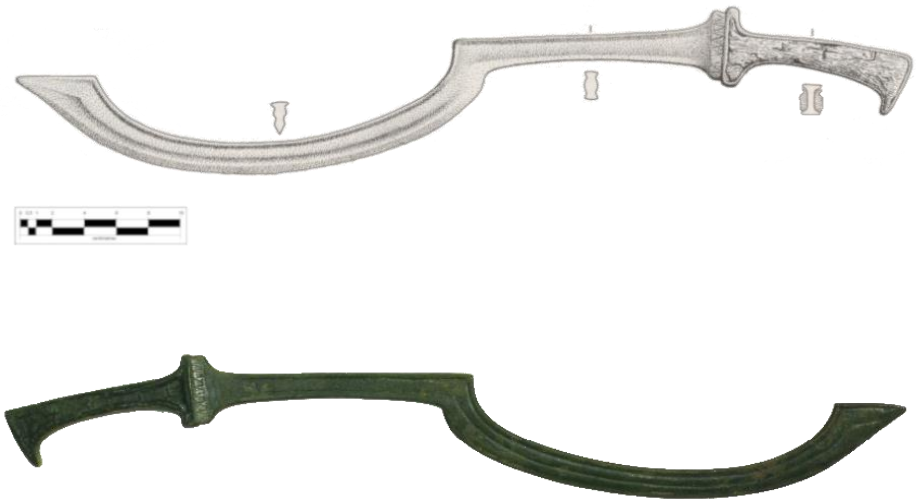


Figure 2.40: Kefar Samir bronze "khepesh" sword (After Misch-Brandl 1985; Shalev 2004).

ID	*Exc ID*	*L*	*W*	*Th.*	*Source*
14A1	N/A	55.8	4.6	2	Raban and Galili 1985; Misch-Brandl 1985; Shalev 2004, 58; Vogel 2013

Bronze Egyptian sickle sword. In Sariel Shalev's typology of five sickle-sword forms (8C-E) in a study of eastern Mediterranean Bronze Age weaponry, sole example of Type 8C. Sword characterized by a single cast blade and hilt with a thick base. Groove-lined ridges on the handle's edges form a central vein. Two wooden plates are inlaid onto the hilt.
The wooden cheeks which made up the handle are preserved. The blade retains some decorative elements; 6-8 triangles made of punched dots, and an engrave line near the base. The cutting edge was on the convex side of the sickle curve. The hardness of the Kefar Samir sword achieves a Vickers Hardness/Hv of 186 at the blade, but only 159 at the base end of the hilt. This disparity results from a less complex treatment of the hilt in comparison to the blade following the initial casting process.

15. Xlendi Bay Wreck (Xlendi Bay, Gozo, Malta) – c. Eighth century B.C.E.

One of the more recent ancient shipwreck discoveries in the Mediterranean is a Phoenician shipwreck in Xlendi Bay, Malta. Xlendi Bay is located on the west coast of Gozo, in the Maltese archipelago. The recency of the ship's discovery and analysis can partially be attributed to its depth, which at 110 m presents challenges for hands-on investigation. Excavation is ongoing and therefore the full contents and disposition of the wreck have not yet been fully published.[294]

15A1. Iron Javelin Head

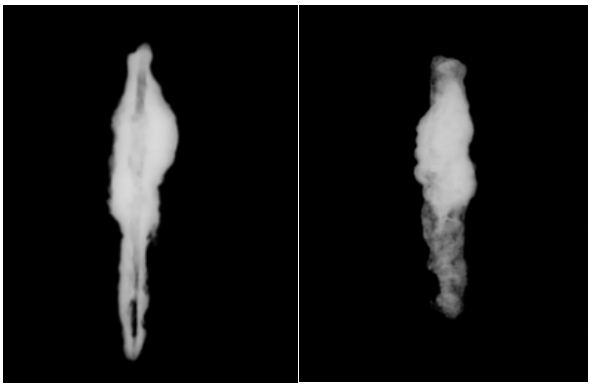


Figure 2.41: Javelin point x-ray image (After Grima 2019).

Cat. ID	*Exc. ID*	*Dimensions*	*Source*
15A1	Project HM16.104.2019 N115/19	N/A	Unpublished

Largely hollow ferrous concretion; x-rayed from several angles. Images revealed a pointed shape with a hollow core of a javelin point or large arrowhead. CT scanning is planned to create a higher-definition 3D image for identification purposes.

[294] However, project director Timmy Gambin has generously provided the author with images of a potential javelin head and conveyed his initial impressions of the artifact.

16. Bon Porte (Saint-Tropez, France) – 550-525 B.C.E.

The Bon Porte shipwreck was discovered in 1971 near Saint-Tropez, France. The wreck, submerged at a depth of 48 m. It carried a cargo of over over 30 wine amphoras, leading to interpretations that it was a merchantman distributing Greek or Etruscan wine. The vessel is well known for its laced hull construction.

16A1. Iron Spearhead

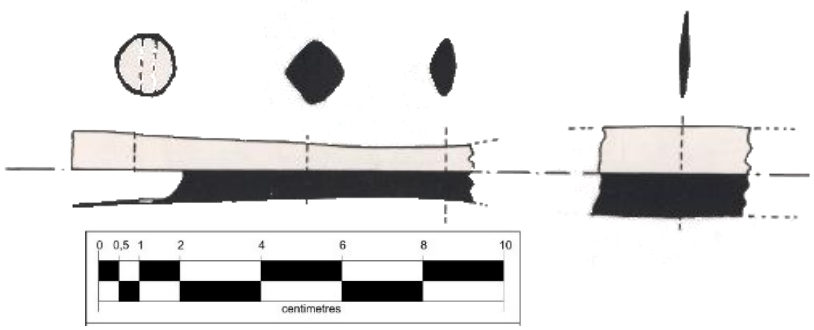


Figure 2.42: Bon Porte spearhead (After Joncheray 1976).

Cat ID	*Exc. ID*	*L*	*W*	*Source*
16A1	N/A	pL 16.2	2.145[295]	Joncheray 1976, 23

Largely eroded ferrous artifact. Reconstructed mold from several ferrous concretions were used to cast a partial socket and blade for a spear or lance. Narrow leaf-shaped blade, max width approx. halfway up its length. Base of blade narrows briefly, widens again to form conical shaft socket, roughly of same diam at base as width of blade.

[295] Dimensions not reported in publication, values presented here are based on the 2:3-scale published image.

17. Dor Southern Anchorage (Tantura Lagoon, Israel)[296] – Late fifth C. B.C.E.

Located approximately 13 km north of the well-known Harbor of Caesarea is the site of an ancient anchorage at Dor, Israel. Over the course of five months in 1991, the Dor Maritime Archaeology Project investigated the area around the southern entryway to this ancient anchorage. A range of excavation zones across the shallow site (2 m deep) contain material ranging from the sixth century B.C.E. to as recently as the 17th century C.E., with a considerable quantity of finds from the Byzantine period.[297] On the southwestern side of the southernmost excavation zone (DW5), an ancient Greek helmet was discovered.

17A1. Bronze Helmet

Figure 2.43: Dor Anchorage helmet (After Raveh and Kingsley 1992).

ID	*Exc. ID*	*H*	*W*	*Th*	*Source*

[296] Raban and Galili 1985.
[297] Raveh and Kingsley 1992, 312.

17A1	N/A	29.4	23.5	0.1-0.5	Raveh and Kingsley 1992, 313-314
		Bronze helmet dated to the late fifth century B.C.E.; components warped and damaged but largely preserved. Helmet identifiable as a *pîlos;* consists of a simple ovoid cap with cheek pieces. Main bowl was made of a single bronze sheet, likely hammered. Most of bowl's bottom edge bends out to form a narrow, outturned rim, but rear side continues briefly to form a small neck guard. A shallow dent on the upper section of the helmet suggests the artifact was damaged – either through combat or other use - prior to deposition. Helmet bears protective cheek-pieces, uncommon for *pîlos* type. Hinges for the cheek-pieces were riveted onto the helmet bowl. Cheek pieces are older than the cap, dating to the mid-5th century.[298] Both pieces are shaped in the form of imitations of facial features, including exaggerating cheekbones, lips, a nose, mustache, and beard.			

18. El Sec Shipwreck (Palma Bay, Mallorca, Spain) – Fourth century B.C.E.

A fourth century B.C.E. Greek shipwreck with a cargo of amphorae, millstones, and bronze containers, was found at a depth of 30 – 33 m off the small island of Sec in Palma Bay, Mallorca, Spain.[299] An analysis of this cargo led Arribas et al. to conclude the vessel had travelled from the eastern Mediterranean, perhaps from near Samos, with stops at Athens and Carthage before sinking in Mallorca.[300]

[298] authors do not elaborate if this is a purely stylistic assessment or more literal dating discrepancy
[299] Pallares 1972.
[300] Arribas et al. 1987.

18A1. Lead Sling-Bullet

No Image			
ID	*Exc. ID*	*Dimensions*	*Source*
18A1	N/A	N/A	Pallares 1972
Lead artifact identified as sling-bullet. This projectile is acorn-shaped with a hole pierced through its upper section. Features linked to those of known sling-bullet types from the Aegean and eastern Mediterranean that were used as weapons by specialists corps within Greek armies during second half of the fifth century B.C.E.			

19. Chretienne C Wreck (La Chretienne Reef, France) – 1st half of second century B.C.E.

The Chretienne C Shipwreck is one of several vessels that sank at varying dates near La Chretienne reef off the coast of France (identified as La Chretienne A-I). The site was discovered in 1952 approximately 800 m west of the aforementioned reef at a depth of 21-25 m. Chretienne C is dated to c. 175-150 B.C.E., largely by its cargo of Greco-Italic amphorae (Will type D). There was a 'living area' near the stern of the ship that was identified by the presence of courseware ceramics and fish-line weights.[301]

[301] Joncheray and Fiori 1973; Joncheray 1975, 88; Parker 1992, 142.

19A1. Javelin Point

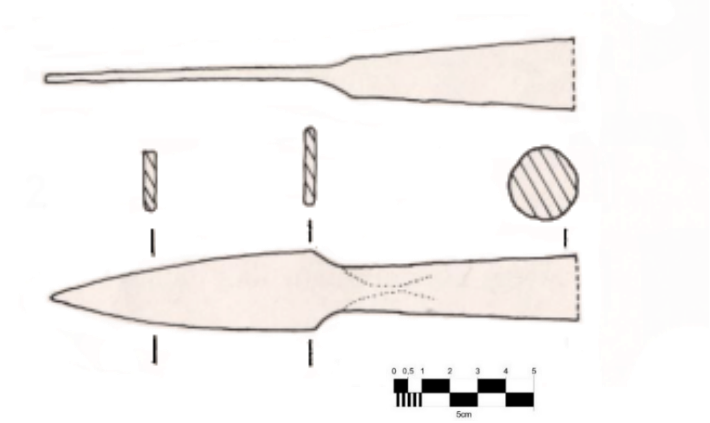


Figure 2.44: La Chretienne C javelin point (After Fiori and Joncheray 1973).

ID	*Exc. ID*	*Total L.*	*Blade L*	*Blade W*	*Source*
19A1	N/A	19	10	2.9	Fiori and Joncheray 1973

Bronze javelin point; blade is a flat triangle with dull, slightly convex edges. Gently tapering conical socket is circular in cross section, and rapidly narrows at end to form blade.

19B1. Fragmentary Iron Dagger

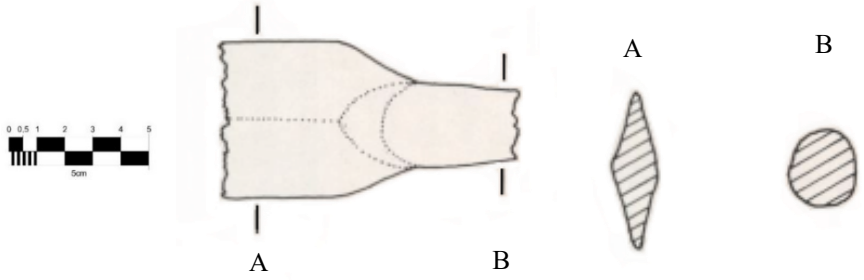


Figure 2.45: La Chretienne C fragmentary dagger (After Fiori and Joncheray 1973).

ID	*Exc. ID*	*L*	*W*	*Th*	*Source*
19B1	N/A	pL 10.6	5	1.4	Fiori and Joncheray 1973

Dagger fragment, all that remains is the base of the blade and part of tang. The latter is round in section, while the blade portion has a flattened lozenge shaped cross section. Both tang and blade are broken in straight lines perpendicular to their lengths.

20. Les Sorres Anchorage Roman Wreck (Gavà-Viladecans, Catalonia) – Second Century B.C.E.

The Les Sorres VIII shipwreck was located sometime in the 1960s, during an extraction of arid land for use in infrastructure projects in Gavà, Spain, a municipal district near Barcelona. The wreck is located in a silted-in anchorage area in the Llobregat River deltaic plain at a depth of 5-14 m between two sectors clearly used historically as anchorages, in an area where finds of ancient material were relatively sparse. There is ambiguity concerning the exact nature and date of the site as the group conducting the "extraction" project initially kept the discovery a secret. This was done to avoid unwanted involvement from the authorities, and led to much of the wreck being left in situ and covered with rubble. As a result, most of the objects on site were destroyed or rendered unrecoverable. However, oral accounts after the fact from witnesses report a wooden hull with significant amounts of lead sheathing. The wreck was also rather large and said to hold a significant number of (probably, based on description) Greco-Italic amphorae.[302] Very few artifacts remain, and most were dispersed to private collections. One of three iron anchors retrieved from the site was gifted to a wealthy family for use as home décor. Two bronze helmets were recovered, one of which was taken by an extracting-machine operator and auctioned by Christie's auction house. The other helmet was first used as décor for the offices of the dredging company before it was eventually claimed by the Gavà Museum, where it is now displayed. Some of the interviewed witnesses claimed that there was a sword, but as individuals without any archaeological training or experience, and without material remains, those responsible for researching the site have not as yet been able to confirm its presence.[303]

[302] Izquierdo and Solias 2000.
[303] Izquierdo and Solias 2000.

While the helmets have been dated within a range extending from the fifth to third centuries B.C.E., other artifacts, like a bronze bell and the iron anchors indicate a much later date for the wreck as a whole. Consequently, Izquierdo and Solias have assigned a date in the second century B.C.E. to the wreck when all the artifacts could ostensibly be on the same sunken vessel.

20A1. Bronze Helmet

Figure 2.46: Decorated bronze helmet (After Izquierdo and Solias 2000).

ID	*Exc. ID*	*H*	*L*	*W*	*Wt*	*Source*
20A1	Private Collection	20.5	22	20.3	1760	Izquierdo and Solias 2000

Bronze helmet, only accessible to researchers via photographs and limited biographical information, as it was illegally transported out of Spain in 1989 and sold at Christie's auction house. The helmet is largely hemispherical, with a noticeable ridge along its longitudinal axis. Symmetrically decorated along this axis with shaped attachments, also of bronze, which were fixed to the base helmet, probably by brazing. From the bottom upwards; on helmet rim, there is a double line of scales. Directly above, and centrally aligned, there is a winged human torso, possibly a representation of a chimera. Above this, taking up most of the helmet's remaining surface area, there is a floral ornamentation, with spiraling stems with several branches dominating both the right and left sides before coming together in the center of the helmet at a small, rose-shaped button. At helmet apex are a pair of protruding maned lions poised to leap, with heavily defined musculature.

20A2. Bronze Helmet

Figure 2.47: Bronze helmet (After Izquierdo and Solias 2000).

ID	*Exc. ID*	*H*	*L*	*W*	*Th*	*Wt*	*Sources*
20A2	N/A	20.2	25.5	18.5	0.05-0.35	1240	Izquierdo and Solias 2000; Bottini et al. 1988, 39-40

Bronze helmet; smooth surface bears no decoration, barring single button on its apex in shape of an upward-facing lion's head. Large hole underneath its mouth. Hemispherical helmet bowl indents along its lower portion, and semicircular cutouts from the rim on both sides left space for free ears. Behind cutouts, the rim extends further downward and flares outward at the end to create a neck guard. In front of each cutout there are small holes, presumably for *paragnatid* attachments or chinstrap. Dated to the fourth or third centur B.C.E. by using comparisons to seven typologically similar examples from Berlin Museum.

21. Megadim A Shipwreck (Megadim, Israel) – 140-130 B.C.E.

The Megadim A shipwreck site is in shallow water off the east coast of Israel near Nahal Megadim. The wreck contained a large assemblage of metal artifacts ranging from ingots to manufactured goods, and tools. There were also Ptolemaic and Seleucid coins. The latest of these is dated to 140-130 B.C.E. and has been used to provide the approximate date of the vessel's

sinking.[304] For our purposes here, the metal cargo of this shipwreck included two bronze arrowheads.

21A1 and 21A2. Winged Arrowheads

Figure 2.48: Hellenistic winged arrowheads (After Misch-Brandl 1985).

ID	*Exc. ID*	***23A1***	***23A2***	*Source*
21A1-2	N/A	L 8.5	L 5.7	Raban and Galili 1985; Misch-Brandl 1985

Artifacts are referenced as "winged arrow heads," in original publication but numbers, dimensions, and even images are not included.[305] Two arrowheads cited in Misch-Brandl; but cannot confirm if total number from site.[306] Arrows made of bronze. Narrow triangular shape of blade with open base corners. Blades lozenge cross section shape. Very narrow tang; curled on **23A2**. Small bulge at join of tang and blade; possible brazing.

[304] Raban and Galili 1985.
[305] Raban and Galili 1985.
[306] Misch-Brandl 1985, unclear phrasing/format.

22. Punta Braccetto Shipwreck (Punta Braccetto, Sicily, Italy) – Early Fifth Century B.C.E.

This shipwreck was found close to shore in very shallow water on the southern side of Punta Braccetto, Sicily. Initially dated to the sixth century B.C.E., analysis of Corinthian A amphorae on board led to a revised dating of the fifth century. Also discovered on site were an *askos* (ceramic vessel for oil), a lamp, and a Corinthian-type helmet.

22A1. Bronze Helmet

Figure 2.49: Bronze Corinthian helmet (After Di Stefano 1994).

ID	*Exc. ID*	*H*	*W*	*Th*	*Source*
22A1	N/A	N/A	N/A	.02	Snodgrass 1964, Di Stefano 1994

Bronze helmet manufactured by hammering a thin sheet of bronze into a hemispheric shape. In center of the cap's apex, an unspecified number of holes were punched from the outside in; likely done to anchor some form of crest or ridge. Large orbital space is cut out in front, open between the cheek pieces, with a short nose guard; likely broken off. Arched ribs outline upper edge of orbital cutouts, riveted to the forehead. Along lower rim and anterior edges of the cheek sections there are a series of holes. Likely for attaching an interior leather or fabric lining. Characteristics classify it as similar to a Corinthian type helmet, from a Peloponnesian workshop. It is attributable to the so-called "first period" product, which places it within a date range between the seventh century and the beginning of the sixth century B.C.E.

23. Camarina Bay (Sicily, Italy) – Late Fourth Century B.C.E.

During fieldwork conducted in 1990, in the center of Camarina Bay, Italy (the same general, unspecified location as Punta Braccetto), an assemblage of Classical ceramic fragments of Greco-Italic style and a bronze helmet were discovered. Located in an area south of the ancient agora, these artifacts were identified as remnants from an ancient shipwreck.[307]

23A1. Bronze Helmet

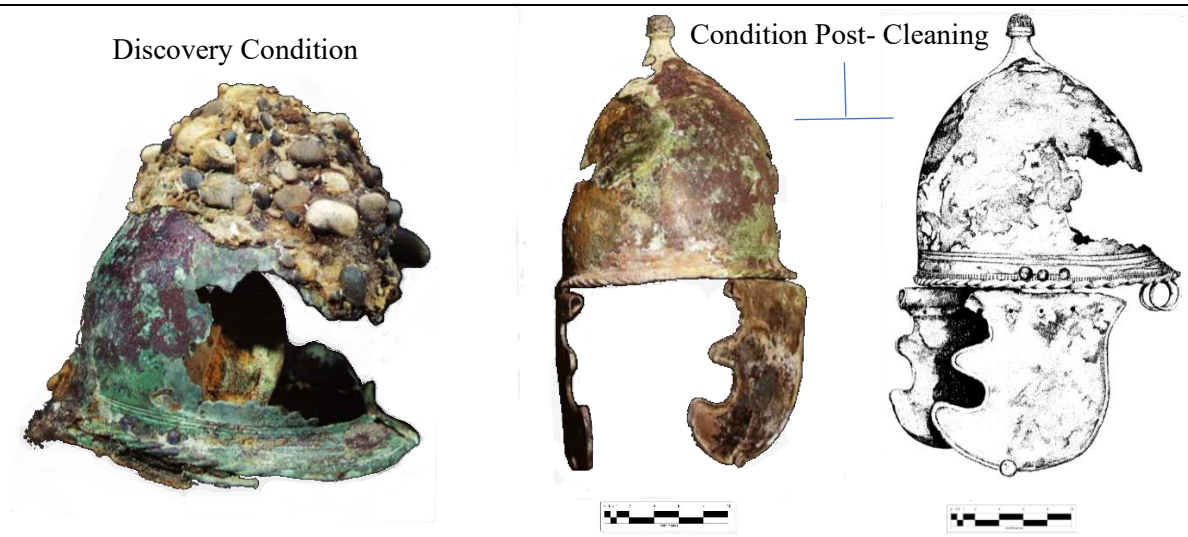


Figure 2.50: Montefortino helmet from Camarina Bay (After Di Stefano 1991 ; Wilson 1996).

ID	*Exc. ID*	*H*	*W*	*Th*	*Sources*
23A1	N/A	35	N/A	N/A	Di Stefano 1991, 180; Wilson 1996

Large bronze helmet; initially identified as a fourth century B.C.E. "Italic-Etruscan," but later republished as Montefortino helmet from third century B.C.E.. Tall helmet made from a single bronze sheet hammered into shape. Initially bore thick concretion across much of the cap's top, but is overall well preserved. Only significant damage is a large break in the cap's rear. Small extension of the brim at the neck forms a guard, from which hang two bronze rings. Attached on either side are hinged cheek-pieces, with pronounced forward-facing cuspids. Hinge attachments riveted in place. Brim decorated with incised lines in imitation of braided rope; above are additional incised lines, including three horizontal bands running the circumference of the helmet. Apex has a 'pine-cone' crest knob.

[307] Di Stefano 1991.

24. Cueva Del Jarro A & B Shipwrecks (Almuñecar, Spain) – 350-250 B.C.E.

Cueva del Jarro is a site in the Almuñecar municipality in southern Spain. The name of the site translates literally as "Jar Cave," a title the site has acquired due to the coastal cliffs containing a surface level-underwater cave near which a large collection of ancient amphorae was found. Located at a depth of 30 m, these ceramics appear to represent two distinct shipwrecks and have subsequently been divided into deposits A and B in archaeological literature. Cueva Del Jarro A consists mainly of Punic Maña A amphorae dated to 350-250 B.C.E., whereas Cueva del Jarro B contains Roman Dressel 20, Dressel 38, and Beltran 2B amphora types among others. Found in association with these assemblages was a bronze muscle cuirass.

24A1. Bronze Cuirass

Figure 2.51: Bronze muscle cuirass (After MAG Website; D'Amato and Sumner 2009).

ID	*MAG ID*	*H*	*W*	*Sources*
24A1	N/A	44.5	37	Pascual 1973; Junta del Andalucía 2018
Bronze cuirass located in close proximity to two deposits of amphorae, associated by Museo Arquelogico de Granada with the Punic assemblage but dated slightly earlier than the wreck itself to c. 400 B.C.E. Breastplate depicts detailed torso musculature; highly unusual for the equipment of common Punic and Roman soldiers or indeed any known combat gear. Most likely belonged to high-ranking officer and limited to use in ceremonial functions.[308] Remnants of hinge attachments near bottom of side edges.				

[308] Pascual 1973.

25. Marsala "Punic Ship" Wreck (Isola Grande, Sicily, Italy) – 250 – 175 B.C.E.

In the same area as the Punta Scario B wreck (**27**), the Marsala Ship – also referred to as the 'Motya,' 'Lilybaeum,' or 'Isola Grande' shipwreck, was situated in approximately 2 m of water some 50 m from the shore of western Sicily. It is a much more widely known shipwreck, largely due to its status as being the first Punic wreck ever discovered. Its dating to 250 – 175 B.C.E. was based primarily on radiocarbon dating of the hull timbers.[309]

While the Marsala Wreck's hull is incredibly well preserved, it contrasts with many other shipwrecks listed here in that it contained essentially no cargo. This led Honor Frost, who spearheaded its initial investigation in 1971, to postulate that it was a warship. This postulation has since been contested,[310] and remains an intriguing topic of debate.

25A1. Iron Dagger

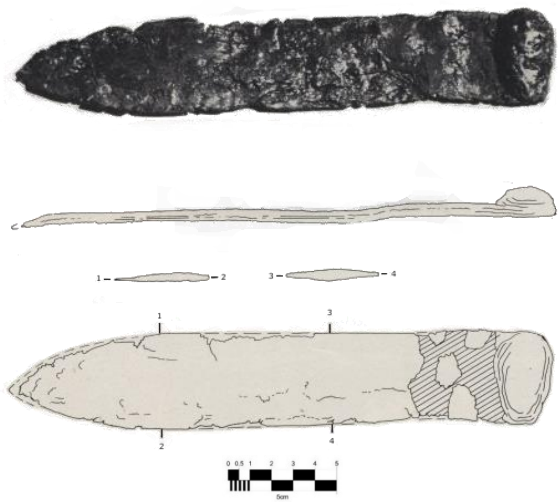


Figure 2.52: Marsala dagger cast (After Frost 1981).

[309] Parker 1992, 264.
[310] Averdung and Pedersen 2012.

ID	*Exc. ID*	*L*	*W*	*Max Th*	*Blade Th*	*Source*
25A1	N/A	25	4.5	0.55	1.5	Frost 1981, 137
One of very few iron finds on the Marsala Punic shipwreck. Object was fully concreted, and had to be x-rayed. The weapon itself was reconstructed by researchers by casting. Blade could not be accurately sectioned through its cutting edges as it had been bent. Therefore, cast was made in several pieces before being assembled. Blade was thin and flat, with a small lump on end opposite its point. Lump interpreted by Frost as remains of rivet or connecting piece which that have attached the blade to a handle.						

26. Punta Scario B (Punta Scario, Sicily, Italy) – 225-150 B.C.E.

During large-scale surveying conducted in 1970 under the auspices of the Soprintendente alle Antichità della Sicilia Occidentale and the British School at Rome, a number of ancient shipwreck sites were identified in the Punta Scario area of Marsala's harbor on the west coast of Sicily. One mortised plank was found at Punta Scario B, a site which consisted primarily of a pile of tufa ballast stones lying in 6 m of water. Work on this site was suspended upon discovery of the Marsala shipwreck site in 1971.[311] Sticking out of the ballast pile on this site was a narrow concretion containing a hollow space where an iron spearhead had corroded away.

In her initial remarks on the site, Honor Frost noted that there was a "complex of indeterminate, delicate metal objects" on the site.[312] One such artifact was tentatively identified as an iron grapnel or *corvus* (**27B1**),[313] but further details have not been published to date.

[311] Frost 1972.
[312] Frost 1972, 114.
[313] Frost 1981.

26A1. Iron Spearhead

Figure 2.53: Punta Scario B spearhead cast (After Frost 1972).

ID	*Exc. ID*	*L*	*W*	*Sources*
27A1	N/A	14.75	5	Frost 1972, 114; Frost 1981
Concretion with hollow space left by corroded ferrous spearhead. Mold of hollow used to create a resin cast.[314] Cast shows pronounced tapering central rib; presumably extended to socket for spear shaft. Blade fins have rounded corners, otherwise triangular with greatest width near base.				

26B1. Corvus

Figure 2.54: Artist's representation of c*orvus* and on-site find (After Frost 1981)

[314] Frost 1972, self-measured based on image.

ID	*Exc. ID*	*Dimensions*	*Sources*
26B2	N/A	N/A	Forlard 1753; Frost 1981, 17, 138
Oddly shaped iron object discovered resting on seabed. Form reminded Dr. Frost of a 1753 illustration by M. de Forlard of a Roman *Corvus;*[315] drawing apparent foundation of artifact's identification. Conical body with protrusions from wide end. Ferrous core metal was sampled; qualitative spectrographic analysis revealed it contained primarily iron, with aluminum, silicon, manganese, sodium and titanium.			

27. Punta Scaletta Shipwreck (Giannutri Island, Italy) – c. 140-130 B.C.E.

This site is at the northernmost point of Giannutri Island in the Tyrrhenian Sea. The area is a rocky bay, where the shipwreck rests at a depth of 33 m on a sloping cliff face.[316] A 30 cm-thick layer of Campanian A black-glazed pottery in a variety of forms ranging from plates to unguentaria has typologically dated the shipwreck to c. 140-130 B.C.E. The site included a number of interesting singular finds, including an ivory flute and a lead-filled animal horn.

27A1. Stone Projectile

Figure 2.55: Spherical stone projectile (After Lamboglia 1964)

[315] Naval boarding device invented for – and used exclusively during – First Punic War, see Polybius *History* 1.22 4-11; Goldsworthy 2004.
[316] Parker 1992.

ID	*Exc. ID*	*Diam*	*Sources*
27A1	N/A	13	Lamboglia 1964, 252; Firmati 1992
Stone sphere which may be a "catapult" projectile, steelyard counterweight, or sounding weight. Dimensions and use of term "catapult" call into question use as personal weapon, as with **6B1**. However, a merchant ship would not have an actual catapult, so potentially hand-operated means of launching projectile in place (i.e. 'dolphin').			

27B1. Iron Dagger

Figure 2.56: Concreted knife blade (After Lamboglia 1964).

ID	*Exc. ID*	*L*	*W*	*Source*
27B1	N/A	0.50[317]	11	Lamboglia 1964, 252-253
Large iron dagger blade; relatively light concretion across surface. The tip is broken off, but a portion of the tang is preserved and was visible even prior to conservation. Curved asymmetrical blade, likely cutting edge on concave side, possibly double-sided. Tang also appears slightly curved, tapered, possible post-deposition damage. Larger size interpretation could allow for identification as short sword.				

[317] dimension, as written in article, is "0,50 cm." Given that European dimension recording formats use a comma where Americans use a period, this must be a mistyped dimension. A 0.5 cm length is impossible. Most likely options are 5 cm or 50 cm, but the information is lacking to make a definitive claim.

28. Grand Bassin B Shipwreck (Grand Bassin, France) – 110-90 B.C.E.

The Grand Bassin B deposit is one of four (A-D) recovered from two dredging dumps pulled from the Grand Bassin (coordinates given as 43 ° 6' N. 3 ° 6' E.[318]), a body of water covering 90 hectares between the lido and marina of the Gruissan commune in southern France. It ranges from 2.5 to 4 m in depth,[319] and its muddy bottom has preserved a significant amount of ancient historical material.

The Grand Bassin B material was consisted primarily of Dressel 1A amphorae that permitted dating of the site to the very end of the second or early first century B.C.E., around 110-90 B.C.E. There was also a significant number of artifacts with Iberian associations such as a bronze plate with Iberian text and four coins from Tarraco (modern day Tarragona).[320] For our purposes here however, the assemblage also included two bronze helmets.

28A1. Bronze Helmet

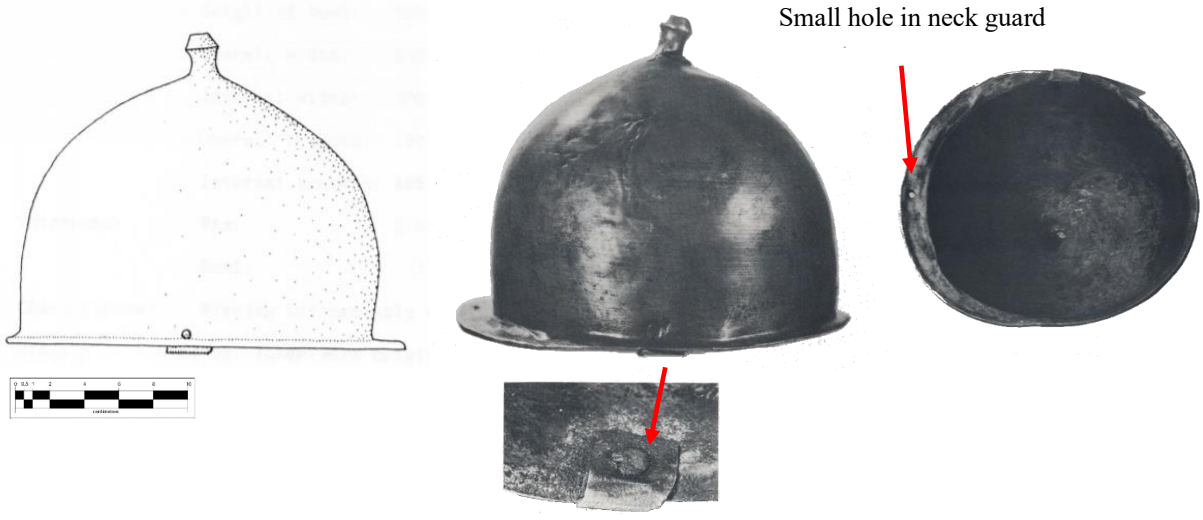


Figure 2.57: Grand Bassin B helmet (After Solier et al. 1981, Paddock 1993).

[318] Parker 1992,198.
[319] Solier et al. 1981, 53.
[320] Parker 1992, 198-199.

ID	*Exc. ID*	*Sources*			
28A1	N/A	Benoit 1969, 16; Mohen 1970, 227 ; Solier et al. 1981, 80			
Tot. H.	*Int. H*	*Avg. Th*	*L*	*W*	*Wt*
18.2	16.5 (to tower base)	2	23	20.3	972

Well preserved bronze helmet. Metal was free of concretion and corrosion barring a light cupreous/cupric patina on the interior surface. The only visible damage was on the crest button, which was warped and suffered minor cracking (later straightened by the research team).

Helmet is made of a single piece of cast sheet bronze that was capped by a crest tower; evidenced by thin, circular streaks on the metal surface there. The final shaping details were completed by hammering from the interior. Simple hemispheric bowl crowned by a hollow and "vaguely smooth" tower.[321] Bottom rim lightly incised and slightly thicker than the bowl wall. Thickening most prominent on the anterior portion of the helmet, where brim widens to create a neck guard. This guard has a small hole in its center: a feature that may have accommodated a rivet that fastened a leather inner cap or lining to the helmet,[322] or accept a metal ring used to hang the helmet.[323] Cheekpieces flaps are lost; retains lateral perforations for them, as well as the base of the right-side hinge. Retained hinge consists of a folded metal slat riveted to the helmet. A bronze pin (absent) would have gone through the fold and served as the locking mechanism in the hinge.

28A2. Bronze Helmet

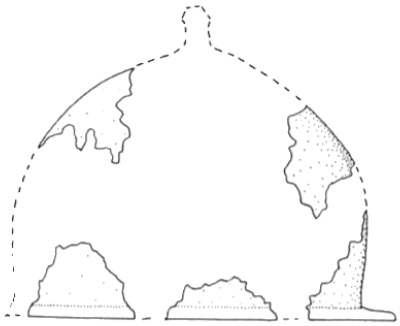


Figure 2.58: Grand Bassin fragmentary helmet (After Paddock 1993)

ID	*Exc. ID*	*Dimensions*	*Sources*
29A2	Private collection	N/A	Solier et al. 1981, 81

[321] Solier et al. 1981, 80.
[322] Benoit 1969, 16.
[323] Mohen 1970, 227.

Highly fragmentary helmet, approximately 20% preserved in five fragments. Located in the same excavation sector as **32A1,** but was completely crushed, either before or during wrecking event. Only lower elements of the helmet are present to significant degree, namely rim and neck guard. All similar in form to helmet **29A1** but no meaningful measurements could be taken due to distortion and fragmentation. Detailed images not available as artifact is in a private collection and no final publication has been made.

29. Antikythera Shipwreck (Antikythera Island, Greece) – c. 80 B.C.E.

The Antikythera shipwreck was discovered in 1900 by sponge divers on the northeast side of Antikythera island in the Aegean Sea. It was located near a dangerous rocky coast at a depth of 50-60 m. The Roman-era vessel (c. 80 B.C.E.) was transporting a cargo of high-status items like bronze and marble statuary. The Antikythera Wreck is most famous for the device of the same name which was found among the cargo.[324] This 'Antikythera Mechanism' appears to be the oldest orrery used in predicting astronomical positions and eclipses for calender and astrological purposes. However, in 2014, a "war dolphin" was discovered on the site by archaeologists from Woods Hole Oceanographic Institute working under the auspices of the Hellenic Ministry of Culture and Sports.[325]

[324] Parker 1992; Weinberg et al. 1965
[325] Barna 2019.

29A1. Lead 'Dolphin'

Figure 2.59: Antikythera 'dolphin' (After Mazza 2016)

ID	*Exc. ID*	*L*	*Wt*	*Source*
29A1	N/A	Approx. 46	100 kg	News Articles[326]

Heavy lead weapon; effectively water-drop-shaped weight tipped with an iron spike, intended to be dropped from the ship's yardarm through the deck and/or hull of an attacking vessel. Longitudinal hole extant, but iron spike not preserved. Only physical specimen of a war dolphin ever discovered. Small ridge along section where dolphin is widest. Very light, patchy coating of marine encrustation. While the dolphin borders on the edge of what can be defined as personal armament, its hand-held use and overall function qualifies it for inclusion here.

30. Dramont A Shipwreck (Saint-Raphaël Bay, France) – mid-1st Century B.C.E.

The Dramont A shipwreck is located in Saint-Raphaël Bay at a depth of 35 m. Dated to the mid-first century B.C.E., it can be considered contemporary with the Madrague de Giens shipwreck, with which it shares similarities in terms of its double-planked hull construction and cargo of

[326] Mazza 2016; Woods Hole Oceanographic Institution. *https://www.whoi.edu/press-room/news-release/artifacts-discovered-on-return-expedition-to-antikythera-shipwreck/*

Dressel 1B amphorae. Although most of the wreck was very well preserved, only a partial bronze helmet was found at from the site.[327]

30A1. Bronze Helmet

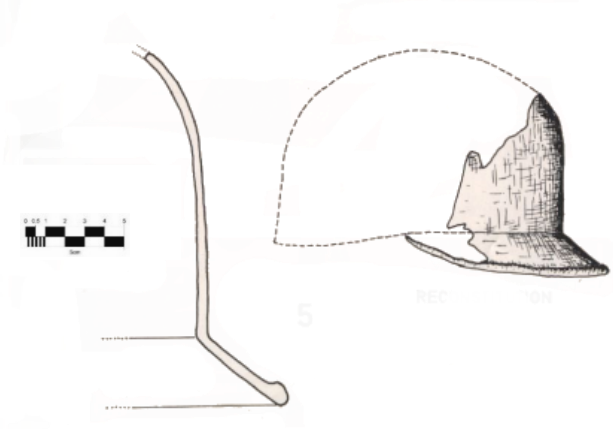


Figure 2.60: Dramont A fragmentary helmet (After Fiori & Joncheray 1973).

ID	*Exc. ID*	*H*	*Th*	*Neck guard L*	*Source*
30A1	N/A	pH 17.67	.01	2 (cntr.) / 1 (sides)	Fiori & Joncheray 1973

Approximately 20% preserved bronze helmet. Consists of a fragment from its rear half. Based on this piece, the helmet was reconstructed as a half-sphere made from thin sheet metal. Preserved section has sloping protrusion that steadily diminishes on the sides. This was interpreted as a visor,[328] But is more likely neck guard based on other contemporaneous helmets; it extends as far as the middle of the bowl and is encompassed by a slightly thickened rim.[329] Possible Haguenau type (see **14A1**).

31. Le Grand Ribaud D Shipwreck (Hyères, France)– 10-1 B.C.E.

This heavily damaged shipwreck is located at the base of a steep drop-off (19 m) on the northwest point of the islet of Le Grand Ribaud in southern France. Due to its poor condition, the

[327] Parker 1992, 166; Joncheray 1975b.
[328] Fiori and Joncheray 1973, 86.
[329] Fiori and Joncheray 1973.

wreck's cargo and hull were sampled and documented but not fully excavated.[330] There were over 200 amphorae attributable to the Dressel 2 through 4 types. Most helpful for dating however were black-glazed pre-Arrentine and Arretine ceramics that place the wreck within the last decade of the first century B.C.E. Among the recovered artifacts were an iron grapnel and knife.[331]

31A1. Iron Grapnel

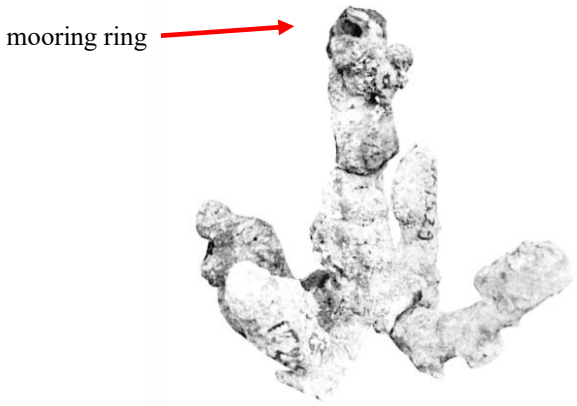


Figure 2.61: Le Grand Ribaud D concreted iron grapnel (After Hesnard 1988).

ID	*Exc. ID*	*W*	*Shaft L*	*W*	*O. Arm (Diam)*	*R. Arm (Diam)*
31A1	N/A	20 x 23	15	4 x 5.5	2.5-3	2
Sources			Hesnard et al. 1988, 117; Frost 1981			
Fragmented concretion from western end of the site. Retained a negative/hollow in shape of four-branched iron grapnel. Rectangular in section along main trunk/axis. Of four branching arms, one is ovular (O.) in section while other three have round (R.) section. Probable profile of the mooring ring on the upper end of the grapnel. Rare find, only comparable example from relevant time period found at Punta Scario B (**27B1**).						

[330] Parker 1992, 203.
[331] Hesnard 1988; Parker 1992.

31B1. Iron Knife

Concretion photograph

X-ray Imagery

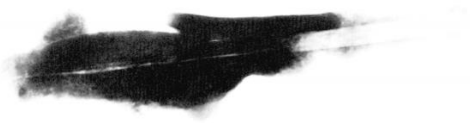


Figure 2.62: Le Grand Ribaud D concreted iron knife (After Hesnard 1988).

ID	*Exc. ID*	*Total pL*	*Blade pL.*	*Tang pL.*	*W.*	*Source*
31B1	N/A	24	14	10	1.7	Joncheray 1975, 16; Hesnard et al. 1988, 93

Concreted mass containing an iron knife. Artifact consists of a flat blade with a rounded edge. The length of the blade is extended by a cylindrical tang, which ends in a conical head. The tang was surrounded by a wooden handle, most likely made in two parts and secured by leather or metal fasteners. Measurements based on x-ray images. Comparable to knife from Dramont D wreck; similar broad blade and round tip. Hesnard argues that, given this artifact's diminutive size and its discovery near the ship's hypothesized cabin area, it is likely a utilitarian knife for use in the galley.

CHAPTER III: ANALYSIS AND CONCLUSIONS

Chapter II focused on sites that are either confirmed or likely shipwrecks in order to restrict our dataset to information directly relevant to our fundamental research questions: (1) how were those on board merchant vessels in the ancient Mediterranean predating the Common Era armed at sea; (2) what do the archaeological remains tell us about the relative frequency of different weapons and prevalence of armor and shields; and, (3) does the archaeological evidence for weapons on merchant vessels present direct evidence for combat and how does that evidence correlate with literary testimony for piratical activity in the ancient Mediterranean. A total of 31 sites were documented that meet these criteria, ranging from c. 1320 B.C.E. right up to the final decade of the first century B.C.E. and excluding any wrecks postdating this time period.

Table 3.1 includes the 31 shipwreck sites mentioned in Chapter II, along with their dates, locations, and the relevant artifact types. In this chapter, I present a statistical analysis of each artifact category, and on what percentage of sites those artifacts were found. I use this information in an attempt to identify trends concerning artifact frequency and concentration. This will be followed by and linked to a discussion of factors and processes affecting artifact preservation in a marine environment, and how these affect the corpus of material discussed. I conclude with an analysis of the geographic distribution of sites across the Mediterranean, with a focus on those with evidence for violence in their demise to mark additional trends and assess whether their locations correlate with known areas of ancient pirate activity like Cilicia and the Tyrrhenian Sea.

Context and Tables

Table 3.1: List of catalog sites with analysis of key features and relevant artifacts

Cat. No.	Site	Location	Date	Weapons/Armor	Material	Association
1	Uluburun	Kaş, Turkey	c. 13250 B.C.E.	Swords, Spearheads, Aroowheads, Maces, Daggers, Armor Scale	Bronze, Stone	Syro-Canaanite, Mycenean
2	Cape Gelidonya	Cape Gelidonya, Turkey	c. 1200 B.C.E.	Spearheads, Sword, Axes, Maces, Knives,	Bronze, Stone	Syrian.
3	Egadi Islands	Egadi Islands, Italy (Sicily)	c. 241 B.C.E.	Helmets, Sword	Bronze, Iron	Roman & Punic
4	Giglio	Giglio Campese, Italy	600–590 B.C.E.	Helmets, Arrowheads	Bronze	'Etruscan' (Greek)
5	Kyrenia	Kyrenia, Cyprus	c. 300 B.C.E.	Spearheads	Iron	Greek
6	Terrasini	Terrasini, Italy	c. 300-260 B.C.E.	Swords, Stone Ball	Iron, Leather Stone	Roman
7	Heraclea Minor	Heraclea Minoa, Italy (Sicily)	270–250 B.C.E.	Helmets	Bronze	Roman
8	Isla Pedrosa	Illa Pedrosa, Spain	150–140 B.C.E.	Knife Blades	Iron	Roman
9	Spargi	Maddelena Islands, Sardinia	120–100 B.C.E.	Frag. Bronze Helmet, Spearhead, Cuirass, possible Knife	Bronze, Iron	Roman
10	Colonia de Sant Jordi A	Ses Salines, Majorca	c. 100 B.C.E.	Knives, Axe	Iron	Roman
11	Albenga	Albenga, Italy	100–80 B.C.E.	Helmets	Bronze	Roman
12	Cap Taillat	Cape Taillat, France (Bon Porte Bay)	c. 100 B.C.E.	Axe, Sword, Spearhead	Bronze, Iron	Roman
13	Valle Ponti	Comacchio, Italy	25–1 B.C.E.	Sword, Dagger, Vest	Bronze, Iron, Leather	Roman
14	Kefar Samir	Haifa, Israel	14th–13th cent. B.C.E.	'Khepesh' Sword	Bronze	Egyptian
15	Xlendi Bay	Xlendi Bay, Malta	c. eighth cent. B.C.E.	Javelin Head	Iron	Phoenician
16	Bon Porte	Saint-Tropez, France	550–525 B.C.E.	Spear/Lance Point	Iron	Greek
17	Dor Southern Anchorage	Dor, Israel	c. 474 B.C.E.	Helmet	Bronze	Greek
18	El Sec	Palma Bay, Mallorca	Fourth cent. B.C.E.	Sling-bullet	Lead	Greek
19	Chretienne C	La Chretienne reef, France	First half of second cent. B.C.E.	Dagger Frag., Javelin Point	Bronze	Greco–Italic (ceramics)

Table 3.1 Continued

Cat. No.	Site	Location	Date	Weapons/Armor	Material	Association
20	Les Sorres	Gavà-Viladecans, Catalonia, Spain	Second cent. B.C.E.	Helmets	Bronze	Etruscan/Roman
21	Megadim A	Nahal Megadim, Israel	140–130 B.C.E.	Arrowheads	Bronze	Hellenistic
22	Punta Braccetto	Punta Bracetto, Sicily	Early fifth cent. B.C.E.	Helmet	Bronze	Greek
23	Camarina Bay Classical	Camarina Bay, Sicily	Late fourth cent. B.C.E.	Helmet	Bronze	Italic (Montefortino)
24	Cueva Del Jarro A & B	Almuñecar coast, Spain	c. 350–250 B.C.E./ c. AD 50–100	Cuirass	Bronze	Punic, Roman
25	Marsala	Isole Grande, Sicily	250–175 B.C.E.	Knife	Iron	Punic
26	Punta Scario B	Isole Grande, Sicily	225–150 B.C.E.	Spearhead and Corvus/Grapnel	Iron	Roman (?)
27	Punta Scaletta	Giannutri Island, Italy	140–130 B.C.E.	Dagger	Iron	Italic
28	Grand Bassin B	Grussan L'Aude, France	110–90 B.C.E.	Helmet	Bronze	Italo-Celtic (Montefortino)
29	Antikythera	Antikythera Island, Greece	c, 80 B.C.E.	Dolphin	Lead/Iron	Roman
30	Dramont A	Saint-Raphaël Bay, France	Mid-first cent. B.C.E.	Frag. Helmet	Bronze	Italic
31	Le Grand Ribaud D	Grand Ribaud Island, France	10–1 B.C.E.	Knife, Grapnel	Iron	Roman

*Sometimes identified as short sword
** Displaced in antiquity from original site of deposition off coast of Cumae, Italy

To further break down these data, we may examine the number of artifacts divided by type. The artifact count is reported in MNI (Minimum Number of Individuals), where a partial or fragmentary artifact represents a complete or intact artifact if it has certain unique diagnostic features, such as a handle for a knife; but multiple non-diagnostic fragments only count as multiple artifacts if they could not plausibly be from the same object. Tables also reflect reported identifications, and it is important to note that in relation to arrowheads, javelin heads, and spearheads, interpretations may be subject to preservation levels, as well as subjectivity on the part of the original author as to what specific dimensions constitute a "javelin head" as opposed

to a "spearhead" as discussed at the beginning of Chapter II. These figures will be presented in the same order as the discussion in Chapter I and material in Chapter II entries, starting with long-range weapons, moving to melee weapons, and concluding with armor. Anti-ship weapons are differentiated from anti-personnel weapons for clarity in later analysis.

Table 3.2: Frequency of anti-personnel weapons found at cataloged sites

WEAPON TYPE	*NUMBER*	*PERCENTAGE OF SITES*
ARROW(HEAD)	64	9.7%
JAVELIN(HEAD)	10	9.7%
SPEAR(HEAD)	31	19.4%
SWORD	11	22.6%
AXE	11	12.9%
MACE	5	6.5%
KNIFE/DAGGER	32	29%
SLING-BULLET	1	3.2%

Table 3.3: Frequency of anti-ship weapons found at cataloged sites

WEAPON TYPE	*NUMBER*	*PERCENTAGE OF SITES*
GRAPNEL	2	6.5%
DOLPHIN	1	3.2%
UNKNOWN STONE PROJ.	2	6.5%

Table 3.4: Frequency of armor found at cataloged sites

ARMOR TYPE	*NUMBER*	*PERCENTAGE OF SITES*
HELMET	29 (min*)	35.5%
CUIRASS	2	6.5%
LEATHER VEST	1	3.2%

*potentially more from Albenga and Egadi

Lastly, the shipwreck sites may also be divided by their chronology and physical location. The former can help us recognize changes in the material culture over time. The latter allows us to analyze the geographic distribution and assess patterns therein. This spatial information should inform whether our sites, and most importantly those with direct evidence for violence near the

wrecking event, correlate with areas having significant literary testimony for ancient pirate activity. Using common era delineations, we can identity five time-periods into which our sites can be grouped. These are the Late Bronze Age (ended c. 1100 B.C.E.), Iron Age (c 1100 B.C.E. – 750 B.C.E.), Archaic period (650 – 480 B.C.E.), Classical period (480 – 330 B.C.E.), Hellenistic period (330 – 31 B.C.E.), and Early Roman Imperial period (31 – 1 B.C.E.).[332]

Table 3.5: Late Bronze Age sites

SITE	*DATE*	*NOTES*
ULUBURUN	c. 1320 B.C.E.	
KEFAR SAMIR	14th–13th cent. B.C.E.	
CAPE GELIDONYA	c. 1200 B.C.E.	

Table 3.6: Iron Age sites

SITE	*DATE*	*NOTES*
XLENDI BAY	c. eighth cent. B.C.E.	

Table 3.7: Archaic Period sites

SITE	*DATE*	*NOTES*
GIGLIO	600–590 B.C.E.	
BON PORTE	550–525 B.C.E.	
PUNTA BRACCETTO	Early fifth cent. B.C.E.	Border of Archaic-Classical

Table 3.8: Classical Period sites

SITE	*DATE*	*NOTES*
DOR S. ANCHORAGE	c. 474 B.C.E.	
CUEVA DEL JARRO A & B	c. 350–250 B.C.E.	Artifact dated c. 400 B.C.E.
EL SEC WRECK	Fourth cent. B.C.E.	Probably Classical, possibly Hellenistic

[332] There is no set date for the start of the Roman Period across the entire Mediterranean as their influence reached different regions at different times. It is defined here as following Battle of Actium

Table 3.9: Hellenistic Period Sites

SITE	*DATE*	*NOTES*
CAMARINA BAY	Late fourth cent. B.C.E	
KYRENIA	c. 300 B.C.E.	
TERRASINI	c. 300-260 B.C.E.	
HERACLEA MINOR	270–250 B.C.E.	
MARSALA	250–175 B.C.E.	
EGADI	241 B..CE.	
PUNTA SCARIO B	225–150 B.C.E.	
LES SORRES	Second cent. B.C.E.	
CHRETIENNE C	First half of second cent. B.C.E.	
ISLA PEDROSA	150–140 B.C.E.	
MEGADIM A	140–130 B.C.E.	
PUNTA SCALETTA	140–130 B.C.E.	
SPARGI	120–100 B.C.E.	
GRAND BASSIN B	110–90 B.C.E	
COLONIA DE SANT JORDI A	c. 100 B.C.E.	
CAP TAILLAT	c. 100 B.C.E.	
ALBENGA	100–80 B.C.E.	
ANTIKYTHERA	c. 80 B.C.E.	
DRAMONT A	Mid-first cent. B.C.E.	

Table 3.10: Early Roman Imperial Period sites

SITE	*DATE*	*NOTES*
VALLE PONTI	c 25-1 B.C.E.	
LE GRAND RIBAUD D	c 10-1 B.C.E.	

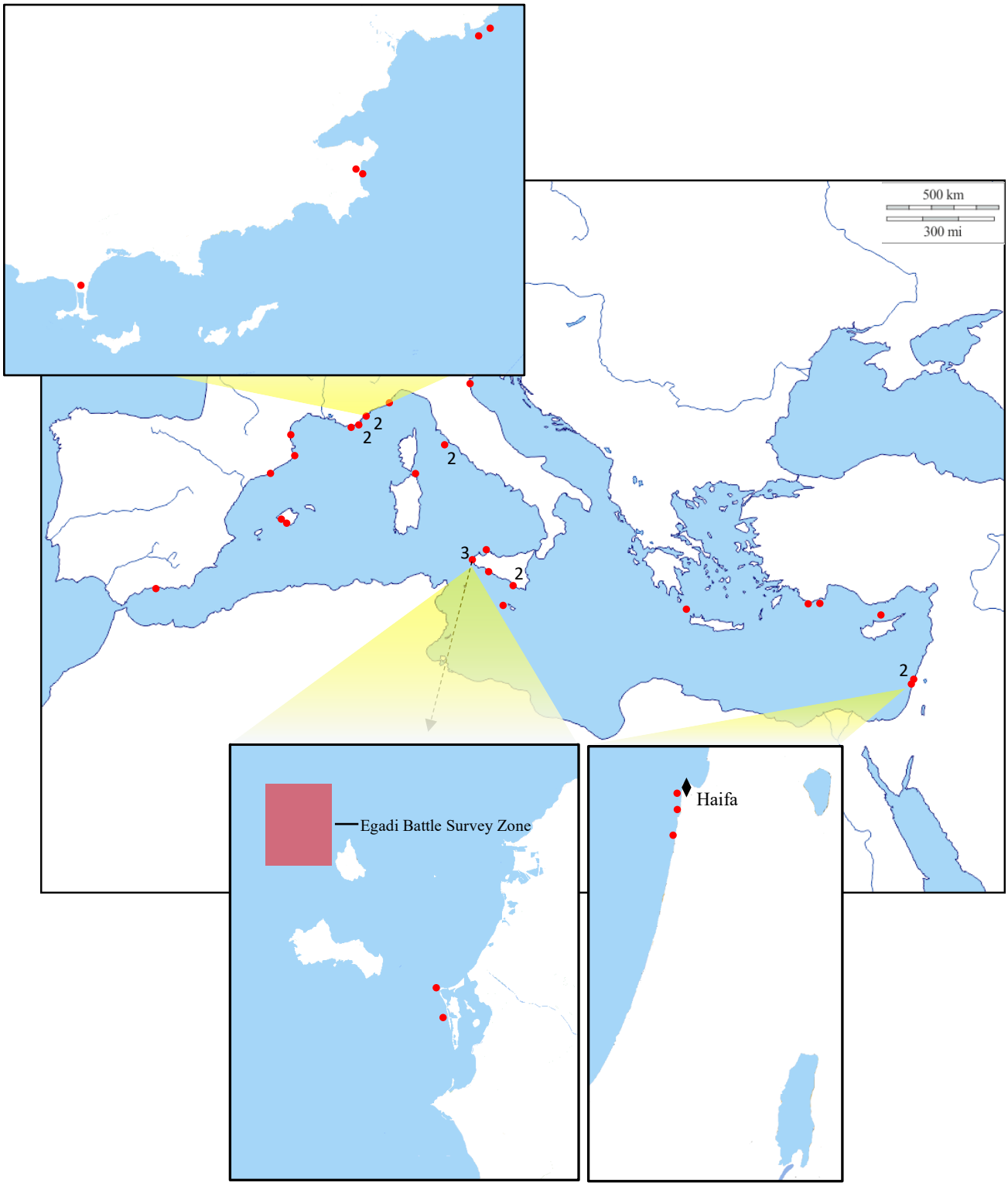


Figure 3.1: Map of Cataloged Sites, with Insets for Concentrated Regions (insets not to scale)

General Artifact Pattern Discussion

Looking at the compiled data, several patterns in artifact composition, type, and concentration are evident. The overwhelming majority of finds were of bronze (80%), with iron a distant second (15%). Other materials represented are wood, leather, and lead. Why this distribution occurred will be explored in the 'Preservation and Conservation' section below (pp. 156–169).

Pattern of Artifact Types: Weapons

Arrowheads

There are 64 conclusively identifiable examples or arrowheads in our catalogs, all of which are made of bronze. They are primarily distributed over two sites, with 32 at Uluburun (**1**) and 30 at Giglio (**4**), with two others found at Megadim A (**21**). Despite their occurrence so few sites, they are chronologically broadly dated to c. 1320 B.C.E., 310–300 B.C.E., and 140–130 B.C.E. respectively. There is no apparent geographic correlation between these sites. The artifact and site total could be increased based on one's interpretation of some of the poorly preserved Gelidonya "spearheads," but here we abide by Bass's original identifications. The fact that this weapon type was found in large concentrations is unsurprising given the necessity to shoot as many as possible before the enemy closed within grappling and melee range.

Javelins

Overall, 10 individual examples of javelins have been documented. Eight were found at Kyrenia (**5**), one at Xlendi Bay (**15**), and one at Chretienne C (**19**). The Kyrenia and Xlendi Bay javelins were both made of ferrous metal, while the Chretienne C example was of bronze. Kyrenia represents the only site where more than one javelin was found. Again, there is potential for

confusion in the archaeological record, as some of the Gelidonya artifacts (see **B161**) could be interpreted as javelins. Like arrowheads, javelins were found at very few sites, but were also found in a much lower number. Furthermore, at Kyrenia it is thought the weapons came from an attacking vessel, and were not the ship's own equipment. Again, there is little in the way of geographic or chronological association between the sites, with Kyrenia (c. 300 B.C.E.) located off northern Cyprus, Xlendi Bay in Malta (eighth century B.C.E.), and Chretienne C (c. 175–150 B.C.E.) in France. The fact that javelins are such a rare find is unusual given their common use in iconography and textual evidence involving naval combat.

Spears

There are a total of 31 spearheads in our catalog. This number makes them the most prolific major melee weapon represented in this study, which squares well with the historical record's emphasis on them as the weapon of choice for boarding or (anti-boarding), and the ensuing commencement of hand-to-hand combat. However, spears were only found on a total of six shipwrecks (18.75% of catalog). The largest concentration, of 22 bronze spearheads, comes from the Uluburun ship (**1**). Five bronze spearheads were found at Cape Gelidonya (**2**), and one iron spearhead each at Spargi (**9**), Bon Porte (**16**), and Punta Scario B (**26**). A solitary bronze spearhead was found at Cap Taillat.(**12**). Again, the Uluburun shipwreck possesses the largest collection of this artifact type and, together with the Cape Gelidonya shipwreck, represent one of only two sites where there is more than a single find of this type. In terms of the number of sites that yielded spearheads, there is an even three-and-three split. The three wrecks possessing ferrous spearheads, Bon Porte (550–525 B.C.E.), Punta Scario B (225–150 B.C.E.), and Spargi (c. 120 B.C.E.) have very tenuous chronological associations, but could be more reliably linked

geographically in the Western Mediterranean, with the first two being located in Southern France and the third off the Northern coast of Sardinia. As for the bronze spearhead sites, Uluburun (c. 1325 B.C.E.) and Cape Gelidonya (c. 1200 B.C.E.) are fairly closely associated both chronologically, and geographically on the southern coast of Turkey. However, Cap Taillat is dated to c. 100 B.C.E., and is found on the opposite end of the Mediterranean in Southern France. As such, it may be more closely associated with the sites bearing iron spearheads.

Swords

A total of 11 swords were found across seven sites listed in our catalog (21.86% of total sites, the highest percentage of any artifact type barring helmets). Six of these are primarily of bronze, with four found at Uluburun, one at Kefar Samir (**14**), and one at Cape Gelidonya. The other five were primarily ferrous, with one discovered at Egadi Islands (**3**), one at Valle Ponti (**13**), two at Terrasini (**6**), and one at Cap Taillat. All four sites with iron swords are associated with the early Roman-era and are located around the Italian peninsula. Similarly, the three sites with bronze swords are the three oldest cataloged sites, all dating to the Bronze Age (c. 1200 B.C.E. and earlier). Additionally, they are all located in the eastern Mediterranean, with two (Uluburun and Gelidonya) in southern Turkey, and Kefar Samir on the Israeli coast.

Axes

Our catalog includes 11 axes from four sites. Again, the largest number comes from the Uluburun (**1**) shipwreck, with a total of five bronze axe heads found at the site. Four bronze axeheads were found at Cape Gelidonya. The last two axes were both ferrous, and found at Colonia de Sant Jordi A (**10**, c. 100 B.C.E.) and Cap Taillat. The geographic and chronologic

associations of Uluburun and Gelidonya have been discussed in the "Spear" and "Sword" sections. The sites with ferrous axes are also temporally associated with each other, with both Colonia de Sant Jordi A and Cap Taillat sites dating to c. 100 B.C.E. Both sites are also located in the western Mediterranean, but not particularly close beyond that, with the former in Mallorca and the latter in Southern France.

In instances where there are multiple artifacts on one site (e.g., Uluburun, Gelidonya), it is thought that at least some were likely part of the cargo,[333] whereas when there is only one, it is likely they were used by the ship's crew. Axes are an interesting category of find, like with knives, as it can be difficult to discern whether they were primarily utilitarian or military in function. In this study, they are considered as possible weapons due to their use in textual accounts and iconography. However, in those records they are assigned only as sidearms for archers (and primarily Near Eastern at least); therefore, axes may be considered evidence for the presence of archers in maritime contexts. As single-bladed axe-heads with narrow necks that expand in height towards their ends the Cap Taillat and Colonia de Sant Jordi A examples are of the correct general shape for this type of weapon, but they are, of course, found in the Western Mediterranean.

Maces

Only five examples were documented in our catalog, all on either the Uluburun (3 examples) and Cape Gelidonya (2 examples) shipwrecks. To reiterate, both are Bronze Age sites on the southern coast of Turkey. All five maces were made of stone, albeit of several types including

[333] Bass 1967; Pulak 1998.

diabase and andesite. Both of the Gelidonya maces were undecorated and of flattened spherical shape (**2C1, 2C2**) as are two on the Uluburun (**1D1, 1D2**) shipwreck. However, the third example (**1D3**) on the latter wreck site is an elaborately made scepter-mace with finely formed ridges. The notable disparity in the quality of this find from the others may likely be explained as being belonging to a northern Aegean or Balkan emissary with a stake in ensuring the Uluburun ship's rich cargo reached its intended destination.[334] However, the relative similarity in terms of simplicity of the other two with those found on the Gelidonya ship – a vessel thought to belong to a traveling craftsman – suggests they were more functional, and possibly used by the crew. It is interesting, however, that no maces of any material have been found of shipwrecks after the Bronze Age.

Knives/Daggers

There are 32 examples of knives and daggers[335] in our catalog, coming from a total of nine shipwrecks. Six bronze daggers and one bronze knife were found at Uluburun. The dagger from Valle Ponti, is evidenced only by the remains of its scabbard (**13B1**). The largest concentration of this artifact type, with 15 examples in one assemblage, comes from the Cape Gelidonya wreck. These are all made of bronze, but are in varying (but generally quite poor) states of preservation. This is a recurring problem for this find type, perhaps because other than those from the Uluburun and Gelidonya shipwrecks, almost all of the examples were made of iron. The preservation of the iron knife at Spargi (**9**) is so poor that it is marked with a question mark in its report. Another iron knife was found at Le Grand Ribaud D (**31**), and two at Colonia de Sant

[334] Pulak 2008, 372-373; source cites evidence of associated region-specific accessories found with artifact
[335] Daggers are defined as having two cutting edges, and knives one. They are grouped together here due to similarity in function during combat.

Jordi A. Both Marsala (**25**) and Punta Scaletta (**27**) shipwrecks boasted one ferrous dagger each, while Isla Pedrosa (**8**) possessed a minimum of three, albeit in the form of fragmentary concretion voids. All of these sites with iron daggers or knives were found in the western Mediterranean, and dated to the last two centuries B.C.E. The only possible exception to this rule is the Marsala shipwreck, which has a reported date range of 225–150 B.C.E.

Knives certainly had a utilitarian function onboard ship. However, as knives are linguistically ambiguous in ancient texts, and lack visual representation, archaeological examples of knives like the *xuēlé* and perhaps, also the *kopís*, may perhaps elucidate their typology in relation to martial use. The archaeology does, however, lead to a new question, specifically if there was an ancient distinction between "daggers" and "knives" that parallels their modern definition, namely that the former has two cutting edges and is generally larger, and the latter have one edge.

Grapnels and Anti-ship Weapons

Only one 'dolphin' is included in the cataloged material, at the Antikythera (**29**) shipwreck. The site's dating to c. 80 B.C.E shows the longevity of this weapon type on merchants, given our main historical account for it dates to the fifth century B.C.E. However, as the sole archaeological example its rarity over this extended period of time is noteworthy. Its scarcity is understandable, however, given that to use such a heavy weapon the merchant vessel had to be in grapnel-range of their attackers, a situation which it is safe to assume was avoided if possible. As such, it may have been used preferentially by larger merchantmen or those carrying particularly heavy cargo that had little hope of outrunning attackers, as a last-resort measure.

We have two grapnels, one from the Punta Scario B (**26**) shipwreck and another from Le Grand Ribaud D **(31)** shipwreck**.** Both are iron artifacts of Roman association from the western Mediterranean – Sicily and southern France respectively – but vary noticeably in shape. While the Dramont A example is a four-pronged grapnel much like one would expect from later shipwrecks, the Punta Scario B example is heavier and conical, as it was designed as part of a larger system which allowed a bridge to connect to an enemy vessel. The presence of a *corvus* at the Punta Scario B shipwreck, a weapon only known from Polybius's accounts of First Punic War naval battles, may suggest that this vessel represents a warship, or that a similar system was employed by merchantmen in a manner akin to 'dolphins.' We also have two stone projectiles, one from the Terrasini shipwreck (**6**, 300 – 200 B.C.E.), and the other from the Punta Scaletta shipwreck (**27**, c. 140 – 130 B.C.E.). Both are spherical, with a lack of marks or distinguishing features. The stone projectiles could conceivably be anti-personnel weapons, but given their size and the general dislike of long-ranged projectiles like arrows, (see pg. 174) it seems more likely these would have been intended as a means of damaging a pursuer's hull and hampering their movement.

Patterns by Artifact Type: Armor

Helmets

Helmets were found at more sites (11 of 31, or 35.5%) than any other artifact type. With the exception of Albenga, regardless of apparent ship size (often judged primarily through quantity of amphorae or other cargo) there were only one or two helmets per ship. Giglio (**4**) had two helmets, one fragmentary (**4B1, 4B2**). Spargi (**9**) had a fragmentary helmet with a skull adhered inside (**9C1**). Helmets were also frequently found on sites with no other evidence for armament.

This is the case at Albenga (**11**, six helmets), Heraclea Minor (**7**, four helmets), Less Sorres (**20**, two helmets), Dor Anchorage (**17**, one helmet), Punta Braccetto (**22**, one helmet), Camarina Bay (**23**, one helmet), Grand Bassin B (**28**, two helmets), and Dramont A (**30**, one helmet). The Egadi Islands (**3**), as a site representing more than one shipwreck, has produced over 20 helmets, 8 of which have been published and included in the cataloged here (**3B1–3B7, 3D1**). The oldest of these sites is Dor Anchorage (c. late fifth cent. B.C.E.), but the majority date to the last two centuries B.C.E. This chronological division is mirrored by a geographical one. The Dor Anchorage helmet was found on the Israeli coast, while all other examples come from the Western Mediterranean, be it off the western coast of Italy (Giglio), in Sicily (Punta Braccetto, Camarina Bay, Heraclea Minor, Egadi Islands), France (Grand Bassin B, Dramont A) or Spain (Les Sorres). It should also be noted that every one of these helmets, regardless of date or site, was made of bronze.

Cuirasses

Despite the prolific numbers of helmets, there are only two finds of cuirasses (**9D1, 24A1**), one at Spargi (**9**), and another at Cueva del Jarro (**24**). Furthermore, the latter site is only sometimes dated to within the time period (at c. 400 B.C.E.) covered in this thesis, with some identifying it as a later Imperial Roman artifact.[336] Armed crew members could have worn leather or *linothṓrax* armor. The leather vest from Valle Ponti (**13C1**) suggests this may have been the case.

[336] D'Amato and Sumner 2009; in this study the Punic identification and dating supported by the Museo Arquelogico de Granada (Archaeological Museum of Granada) is used.

Shields

Absolutely no finds of shields were made at any shipwreck site. I believe this speaks volumes concerning how shields were made and used (discussion on pp. 172-174). Even if shields were fitted with only a layer of bronze, it would be strange that none have survived, as have bronze helmetes only 1–2 mm thick.

Preservation and Conservation

A significant issue facing the documentation and analysis of ancient arms and armor from marine sites is the preservation of the artifacts themselves. Subsequently, a review of how different materials degrade in marine environments is conducive to a properly contextualized analysis of our archaeological data. Below is a table of artifacts sorted according to their construction materials. There is some overlap due to composite artifacts like the Valle Ponti sword (**13A1**), which had bronze, iron, and wood components; and bronze spearheads with wood fragments preserved inside their shaft sockets.

Table 3.11: Material composition of cataloged artifacts

MATERIAL	*# OF EXAMPLES*	*% OF TOTAL (208 TOTAL)*
BRONZE	167	80.3%
IRON	31	14.9%
WOOD*	15–17	7.2–8.2%
STONE	7	3.4%
LEATHER	2	0.96%
LEAD	2	0.96%

* no artifacts were primarily of wood, but some wood was preserved on swords and in spearhead sockets

The cataloged artifacts presented in Chapter II were comprised of bronze (80.3%) or iron (14.9%), with small amounts of wood, stone, lead, and leather. In light of the particular prominence of bronze, iron, and wood in weapon and armor construction, I will describe how these materials degrade in a marine depositional context before examining what these processes and other general environmental conditions mean for the quality of our dataset. While none of this is new, it is important to consider how such factors may lead to a preservation bias. Bronze helmets represent a significant proportion of our body of evidence, at least in part because bronze preserves in marine environments better than ferrous and organic objects.

Iron weapons, with very few exceptions - namely artifacts like the Valle Ponti sword (**13A1**), were incredibly poorly preserved at all sites. All extant iron artifacts consisted of a metal core surrounded by corrosion products eliminating surface detail, or were entirely corroded away leaving only a hollow concretion, which, in turn, could be used as a mold for casting a replica/mold.

Copper Alloys including Bronze

By far the most common, and best preserved, finds were made of copper alloys. This again is unsurprising. Bronze, like all cupreous metals, is relatively noble and able to survive the adverse conditions of extended submersion in salt water. Cupreous metals react with the environment to form compounds such as cuprous chloride (CuCl), cupric chloride (CuCl2), cuprous oxide (Cu2O). In a marine environment, the two most common copper corrosion products are cuprous

chloride and cuprous sulfide (CuS2).

The principal harm facing cupreous metals involves the formation of the last two compounds resulting in a process commonly known as “bronze disease.” The electrochemical corrosion of copper and copper alloys starts with the production of cuprous ions. These ions bond with chlorine from sea water to form cuprous chloride as a major corrosion product. As a compound, cuprous chlorides are highly unstable, and when exposed to air are hydrolyzed into hydrochloric acid and basic cupric chloride. The hydrochloric acid in turn attacks the uncorroded metal to form more cuprous chloride. The reaction feeds back upon itself until all the metal is consumed.

Barring this, copper and derivative alloys like bronze are fairly resistant to chemical corrosion.

Cupreous artifacts submerged in saline environments are converted to cuprous and cupric sulfide (Cu2S and CuS) through sulfate-reduction - meaning without oxygen; copper sulfide compounds are typically at their lowest oxidation state.[337] After recovery and exposure to oxygen, the cuprous sulfides oxidize to a higher oxidation state, i.e. to cupric sulfide. Upon removal from its enveloping marine encrustation, copper and cupreous artifacts are generally covered with a black powdery layer of copper sulfide. Occasionally, the corrosion process will result in pits on the artifact’s surface, but this is more common in alloys where tin or zinc are preferentially corroded. Unlike cupric chlorides, this copper sulfide film is stable and does not adversely affect the object following retrieval to the surface. Their only downside is cosmetic, and can be easily removed.[338]

[337] Hamilton 1999.
[338] Hamilton 1999.

Due to the relative stability of cupreous alloys, in addition to its popularity as a medium of armament manufacture, one can expect a significantly higher number of bronze artifacts to survive extended periods of deposition when compared to their iron counterparts. However, this accepted disparity is also a product of preservation bias.

Bronze helmets represent a large portion of the artifacts in this catalog. While most were initially covered in encrustation, much of the actual damage to the integrity of the artifact itself was caused by physical breaks. Chemical corrosion was a secondary factor in most instances.

Iron/Ferrous Metal

Iron corrodes in sea water through the creation of a galvanic cell in which two areas of the same metal are connected by means of an electrical or ion-conducting electrolyte (e.g. sea water), allowing an electrochemical reaction to occur. The electrochemical oxidation of iron results in the formation of ferrous ions as the initial product. This process occurs relatively slowly on terrestrial sites, where ground and air moisture form an inefficient electrolyte, but the process is significantly accelerated in sea water. Not only is water generally a superior conduit for corrosive processes, it also becomes more corrosive as its salt content increases. Iron corrodes up to five times faster in salt water than in soil, and up to 10 times faster in salt water than in air.[339]

[339] Cornet 1970, 439.

Even after burial or the formation of an encrustation layer, iron can continue to corrode due to the action of sulfate-reducing bacteria. Sulfate-reducing bacteria are commonly found in aqueous contexts like waterlogged soil, fresh water, and salt water, where decomposing organic material consumes oxygen to form localized anaerobic environments. Sea water has a large quantity of sulfates, and under anaerobic conditions, bacteria use hydrogen to break down the sulfates (SO4)-2 into sulfides (SO-2). To compound the problem, the hydrogen sulfide created as a by-product of this process reacts not only with iron but also with all metals used in antiquity (barring gold), and serves to accelerate the ongoing corrosion process. In certain contexts, up to 60 percent of the corrosion of iron in salt water can be ascribed to the activity of sulfate-reducing bacteria.[340]

On shipwrecks in particular, iron often suffers problems of preservation. Direct association with wood has a negative impact on the integrity of most metals. This is because as wood decays it consumes oxygen. This not only forms an anaerobic environment that supports the proliferation of sulfate-reducing bacteria, but also provides sustenance for the bacteria. This corrosion reaction is most evident on iron, silver, and lead in direct contact with wood. Subsequently, it is unsurprising that the catalog presented in Chapter II, which focuses on sites in at best brackish estuary water, contains few well-preserved iron artifacts. Of the 31 artifacts comprised primarily of iron, all had lost significant mass and/or surface detail, and nine were represented only as a hollow concretion which could be measured or used as a mold to cast a replica of the lost artifact.

[340] Pearson 1972, 35.

Furthermore, all the iron artifacts cataloged in this study are weapons. No iron armor was discovered on any of the cataloged sites, even though it was used in protective armament as early as fourth century B.C.E. in Macedonian royal tombs at Vergina for example. Iron armor variants such as *lorica hamata* (chain-mail) and *lorica squamata* (scale armor) were fairly common in the Roman Republic.[341] Assuming, as discussed in Chapter I, that Roman marines were equipped similarly to terrestrial troops, it is highly unlikely that none of the soldiers at the Battle of the Egadi Islands wore armor. This, in conjunction with the repeated discovery of bronze helmets throughout the survey zone, suggests that thin iron armor simply did not survive in the salt-water environment. This is particularly true due to the exposed sandy bottom that makes up much of the known battle zone, and which has often been dragged by trawler nets over the years. It should be noted, however, that this is precisely the context in which a sword was discovered, but only as a hollow cavity within a large concretion. The shape and configuration of metal in scale and chainmail provide offer significant surface area relative to the overall mass of metal present, allowing corrosive agents to attack much of the metal immediately following deposition, resulting in rapid deterioration.

Wood

Wood decays under both biological and chemical deteriorated when deposited in most archaeological contexts. In shipwreck sites, the wooden components of the hull and small artifacts of wood can often survive in reasonable condition, albeit with reduced structural

[341] Bishop and Coulston 2006.

integrity. Woods are divided into two broad categories: hardwoods and softwoods. Hardwoods come from angiosperms, which are broadleaved and usually deciduous trees. Angiosperms are referred to as 'porous' woods because they have vessel pores. Common examples of hardwoods are oak and birch. Softwoods come from gymnosperms, or needle-bearing trees or conifers like pine and spruce. Gymnosperms are considered 'non-porous' because their cells lack vessel pores for transporting water.

Despite the fact that wood from the ship's hull was preserved at a fair number of the cataloged sites, wood from relevant artifacts was rarely preserved, appearing in 15 – 17 (**1B1–1B9, 5A1–5A8, 13A1, 14A1**) individual objects across three sites. In most cases when present, it was preserved as fragments within spear shaft sockets, which afforded some protection.

The wood listed in the catalog consists of fairly small sample size, but also visibly heterogenous in nature. Of the Uluburun spearheads, all 8–10 (**1B1–1B4**, **1B8** others have no individual entry) containing wooden shaft fragments were determined to be softwood (pine).[342] The Valli Ponti Sword (**13A1**) had an elm (hardwood) pommel knob, and alder (hardwood) wood guard knob. Unfortunately, the wood preserved on the Kefar Samir sword handle was of an unspecified species.

[342]Personal communication with Cemal Pulak.

Factors Affecting the Data: Environmental Considerations

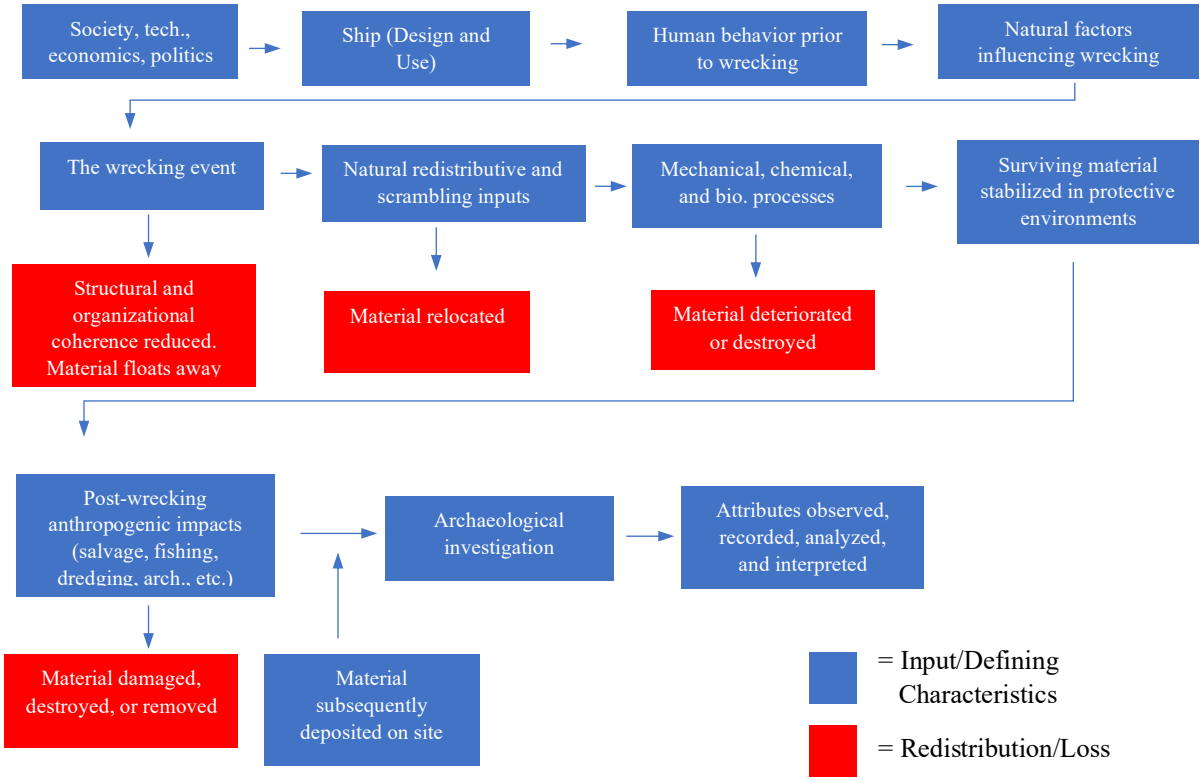


Figure 3.2: Wreck-site formation flowchart (After Martin 2011)

A peculiarity of shipwrecks, in contrast to the majority of archaeological sites, is that they are mobile microcosm of material culture that may represent cultures from different regions. As such, their location is more a function of chance than intention and the conditions in which they are found vary widely. As such, the conditions in which they often find themselves are widely varied. No two wreck sites are deposited under identical circumstances and within identical contexts, with each being made up of an amorphous system of complex variables.[343]

[343] Martin 2011, 47.

The dynamism and often violent/destructive nature of wrecking events means that archaeological material can often be damaged and/or scattered right from the outset of the site formation process. Of course, a vessel that is intentionally run aground is spared the majority of immediate harm as opposed to a ship which sinks due to crashing into rocks during a storm. Following the wrecking event, how much of the ship and its contents are preserved is largely dependent on how quickly it is sedimented, a process which shields the cultural material from the kinetic forces of a marine environment and creates the anaerobic conditions which preserve artifacts made of organic materials.

Once a wrecked ship settles on the seafloor, sediment will deposit in and around it. Wrecks which are deposited on sandy seafloors are more cohesively preserved than those which sank on rocky ones.[344] Timbers and other organics can only be preserved in warm, shallow Mediterranean waters if they are quickly buried by fine-grained sediment, and remain in this state where they are protected from wood-boring organisms and other harmful agents.

Scouring (defined as the removal of sediment from an area of seafloor by wave action and current) and associated depositional processes that are produced by hydrodynamic forces are frequently the dominant physical processes acting at shipwreck sites. Scour is initiated by the deposition of a shipwreck on the seafloor, leading to a rise in current flow velocity and the intensity of turbulence as new blockages are formed around the newly introduced structure. The impact of scour processes is most prominent during the early phases of wreck-site formation following deposition, during which time physical processes are the primary factors in wreck degradation/alteration.[345] Overall, sites with high rates of sediment transport - e.g. those in

[344] Muckelroy, 1978, 60; Ward et al. 1999a.
[345] Quinn 2006.

shallow water unprotected from forceful wave action, where sites can be repeatedly exposed and reburied - exhibit high degrees of decay and degradation.[346] Buried artifacts are shielded from repeated scouring by sand and are often better preserved than the ones exposed to the abrasive effects of moving sediment.[347] Following the outcomes of these (relatively) short-term processes,[348] a number of environmental considerations come into play to affect the long-term preservation of archaeological material on shipwreck sites.

Another major factor affecting survivability is the depth of shipwrecks. The ability to physically find and reach shipwrecks have limited the number of such sites currently in the archaeological record. The vast majority of sites in this catalog were located within two km of an island or coastal shoreline at a depth of 60 m or less. Almost all were discovered by chance due to their relative accessibility. While this allowed researchers to study them with basic SCUBA diving means, it also places them at risk of looting, accidental damage from commercial activity, flora and fauna, and the detrimental effect of current and wave action and other kinetic forces for those particularly close to the surface. Terrasini (**6**), Colonia de Sant Jordi A (**10**), Kefar Samir (**14**), Marsala (**25**), Punta Scario B (**26**) are all at a depth of 6 m or less. While sandy seafloor preserved significant portions of wooden hull remains at Marsala and Colonia de Sant Jordi A, mere fragments remain at Terrasini, and Kefar Samir and Punta Scario B (the shallowest site cataloged at only 2 m) no organics materials survived whatsoever.

[346] O'Shea 2002; Ward et al. 1999b.
[347] Stewart, 1999; Secci et al. 2021.
[348] Which is not to say sedimentation/scouring ceases to be a factor entirely, simply that its primacy wanes.

The catalog includes two sites from shallow coastal lagoons with brackish-to-salt water, Grand Bassin B (**28**) and Dor Anchorage (**17**). The former was reported to have a muddy bottom which preserved a significant amount of metal and organic material, but the site was discovered during dredging which, of course, damaged much of the archaeological material. In general however, there is a trend where preservation generally improves when bottom conditions are described as alluvial or silty as at Albenga (**11**) and Bon Porte (**16**).

Valle Ponti (**13**) is perhaps our best-preserved site, likely because it was never properly submerged. Grounded on a sandy beach, it was rapidly covered by sand and gradually buried before its eventual discovery 4 m beneath a streambed. The anaerobic conditions provided by the fresh-waterlogged soil were beneficial for the preservation of organics for the reasons described above, which is why the only leather artifact in our catalog comes from this site.

The majority of the sites examined were within 40–60 m depth. While this range allowed their study by researchers as early as the late 1950s and early 1960s with still nascent SCUBA equipment and other diving technology, it also left them vulnerable to looters and accidental damage from fishermen. This depth range is also not ideal for preservation. This is because, beyond human interaction, pH, temperature, and dissolved oxygen content can also impact the rate of biological and chemical degradation processes. Therefore, recognizing and monitoring these environmental parameters is essential to assessing the potential of site preservation. Temperature is linked to depth, as generally the deeper one goes the colder it becomes, as less heat penetrates from the surface. Low temperatures limit the range of life-forms that can survive

and damage artifacts of a site. Furthermore, it limits the amount of energy available to perpetuate chemical reactions like the corrosion of metals. Unsurprisingly, cultural material – particularly organics – suffer in acidic or low pH levels.

As deep-water exploration and recovery technology improves, the number of wreck sites that will become accessible to archaeologists can only increase. Twenty-five years ago it would have been inconceivable to dive on the wreck at Xlendi Bay, at a depth of 100 m. It would also be effectively impossible to survey a site as large as the Egadi Islands at a depth of 80–100 m without Remotely Operated Vehicles (ROVs), due to the limited bottom-time divers have at that depth. Deepwater surveys using submarines and ROVs at Skerki Bank, Sicily[349] have also already identified several Roman shipwrecks at a depth of 850 m. Furthermore, conditions at this depth are overall more suitable for the preservation of organic material, with lower temperatures, pH, decreased oxygen saturation, and fewer numbers of intrusive marine organisms.

Preservation Conclusions

The Mediterranean environment is not terrible, but also not ideal for the preservation of materials used in manufacturing ancient weapons (e.g. bronze, iron, and wood). In a 2015 study, the results of Mediterranean subsurface climactic conditions were recorded at outflow points in the Strait of Gibraltar. This research found that potential temperature oscillated between 13.01 and 13.63 °C, salinity of between 38.01 and 38.48 parts-per-thousand, and pH in total scale (at a reference

[349] Ballard et al. 2000.

temperature of 25 °C) between 7.8618 and 7.9370. The mean pH value was 7.8934 ± 0.0076.[350] This fairly neutral pH level is not particularly aggressive towards organic materials like wood, but in combination with salinity it does not to help over long periods of time either. If archaeological material is not covered by sediment, it will degrade fairly rapidly in Mediterranean waters along the lines described in the material preservation section above. Therefore, one should expect a fair amount of preservation bias in our data skewed towards bronze, as it is the material most able to withstand the effects of these corrosive agents and processes.

Ironically, among the best-preserved Mediterranean shipwrecks are those that are not found in the Mediterranean Sea at all, but those that ran aground and were quickly covered over with sand or alluvial silt and sediment like the Valle Ponti shipwreck. Such sites are not subject to the detrimental effects of seawater for extended periods, and the anaerobic context preserves organics such as wood and leather. The only downside is that they do face the risk of damage from human activities such as dredging, trawling, etc. if not properly protected. The 2001 Convention on the Protection of the Underwater Cultural Heritage established guidelines for preserving and studying shipwreck sites, and was ratified by the majority of European and North African countries with Mediterranean coastlines (but not Turkey and Israel). However, as an UNESCO resolution it cannot be directly enforced, and is designed to protect submerged sites, not grounded wrecks potentially found on private land. Legislation at a national level in the Mediterranean is much more erratic, and is usually handled on a case-by-case basis using

[350] Flecha et al. 2015.

legislation written for the protection of cultural heritage in general, in conjunction with marine salvage laws and other fields rather than laws designed explicitly to protect maritime heritage.[351] Assuming appropriate legislation and procedures are in place, however, these sites should provide the best-preserved archaeological material outside of deep-water sites for future studies.

Concluding Remarks

There is a temporal disconnect between much of the literary evidence presented in Chapter I and the currently available archaeological evidence cataloged in Chapter II. Three of the most prolific sources used in this study - Herodotus, Thucydides, and Xenophon - all primarily discuss equipment and naval conflicts in the Greco-Persian (499–479 B.C.E.) and Peloponnesian Wars (431–404 B.C.E.). However, shipwrecks with weapons anywhere near the Aegean from this period have yet to be found. Direct comparisons between literary passages and archaeological evidence are notoriously problematic. Of the few wrecks from this general timespan - Bon Porte (**16**), Dor Anchorage (**17**), and Punta Braccetto (**22**) - two have yielded helmets (**17A1, 22A1**) and one a spearhead (**16A1**). No material has been discovered that can clarify the questions posed about sword and knife typology, nor for the use of shields. If future researchers locate wrecks dated from 700–400 B.C.E. with relevant armament, they would lend significantly more credence to claims made here concerning these issues. Swords do appear in maritime contexts with regularity in the Roman Republican period, but with the general scarcity of Archaic and

[351] see the high-profile case of the *Nuestra Señora de las Mercedes,* a Spanish Galleon found off the coast of Portugal and salvaged by an American company. The process was extensively litigated.

Classical Greek material, it is difficult to conclude whether this is representative of a difference in practice and historical preference or due simply to preservation bias.

Where our catalog proves more useful, is perhaps in painting a direct picture on how the crews of merchant vessels protected themselves and their cargo. The evidence suggests that only a portion of the crew on any given vessel, typically only one or two individuals, would have been armed. Metal helmets appear to have been fairly common, but metal armor and shields were not (Table 4). If torso armor was used, it was likely made of a degradable material such as linen or leather. Spears are also fairly common, but not more so than swords (Table 2). Long-range weapons such as javelins and arrows appear on relatively few wrecks, suggesting merchant vessels were not prepared to defend themselves at range (Table 2).

Chronologically, well over half of our total sites, specifically 19 of 31 (or 61%) are dated within the Hellenistic Period (330 – 31 B.C.E.) (Table 9). Of these, all but three (Kyrenia, Megadim A, and Antikythera) sites are from the Western Mediterranean. This is by far the largest concentration across the recognized time periods covered in this study. Interestingly, it is also a period during which powerful kingdoms across the Mediterranean were vying for control over its waterways. In the east, the Diadochi fought a series of wars over the remains of Alexander the Great's empire. Included in these was the aforementioned 306 B.C.E. Battle of Salamis (pp 3, 14, 33, 39) as Ptolemy I of Egypt and Antigonus contested dominion over Cyprus and the Aegean. In the Western Mediterranean, the Punic Wars (264 – 241 B.C.E.), and in particular the First Punic War (264 – 241 B.C.E.) saw a number of naval battles, fleet building projects, and

shifts in maritime supremacy as Rome gradually superseded the previously dominant naval power of Carthage.

The sites with the largest assemblages from this period are the Egadi Islands (**3**) and Albenga (11). The former is a unique case in its identification as a battle site, and while it currently boasts a sword and over 20 bronze helmets, there is great potential for additional discoveries in the future. The latter site is dated to 100 B.C.E., but has a similar composition in its assemblage of relevant artifact with 6+ bronze helmets. In general, bronze helmets are the most widespread find from the period, and throughout much of the cataloged material in general. Weapons vary, but are almost always made of iron, suggesting either a transition in common weapon manufacturing practices or a threshold for iron artifact preservation.

The proliferation of helmets, and the frequent lack of any weapons found along with them, is curious. This may mean that only one or two crew members were lightly armored, but not armed should actual combat occur. This would suggest that they were not intending to effectively counter concerted pirate raids by equipping their entire crew, but perhaps provided sufficient defense primarily to ward off opportunistic vandal attacks. The exception to this rule is offered by the Albenga ship (**11**), as the discovery of six or seven helmets on site has been interpreted as evidence for a military detachment protecting a state-sponsored transport vessel, an identification influenced by the sheer quantity of cargo rather than the value of individual artifacts like the Uluburun ship. The over 1,200 amphorae recovered from the Albenga shipwreck represented only a portion of the cargo.[352]

[352] Lamboglia 1964, Morel 1981, Parker 1992.

In these instances, the merchants' intent may have been to outrun the more committed pursuers. Given the number of helmets and weapons at any given site, only one or two crew members would have been adequately armed to engage in melee combat. Using the Kyrenia ship (**5**) as a benchmark, a replica of this 13.6 m long vessel, which was found carrying just over 400 amphorae and various other cargo, indicates that it would have been crewed by four individuals.[353] This shipwreck is among the smaller vessels included in our study with more or less completely preserved cargo, while our largest is the Albenga shipwreck with an estimated cargo of 11,000–13,500 amphorae.[354] If one assumes a roughly linear positive correlation between cargo capacity and crew size, it may be tentatively estimated that crew size for merchantmen in our catalog ranged from three or four on the low end to a maximum of a dozen sailors. Helmets may have been worn to survive ranged attack during evasion, which appears to have been the primary goal given such light armament in most instances. However, assuming a crew size of a dozen sailors for Albenga, the six or seven helmets on site would have equipped only one half of the men on board. Furthermore, the only other site that has more than two helmets is Heraclea Minor.[355] It appears, therefore, that none of the shipwrecks in this study have yielded sufficient numbers of helmets to equip more than half the crew at most.

There is also a total lack of shields in the archaeological record, which is again curious if the emphasis was on defense; this situation, however, may rather suggest that the goal was evasion. The closest direct archaeological evidence for a shields at any of the cataloged sites is a timber

[353] Katzev 2007.
[354] Tchernia and Pomey 1978.
[355] for which we unfortunately have no information on ship size.

from the Marsala wreck site (**25**), which Frost tentatively identified as a "shield holder?"[356] She makes the argument that the piece represents a stanchion secured to the wash-strake by a pair of nails at the bottom, and where the two upper holes that retained cord fragments were used to secure a shield. Signs of wear in the holes underneath the cords suggest whatever they may have held rubbed against the wood.[357] However, the lack of comparable finds makes this identification difficult to confirm.

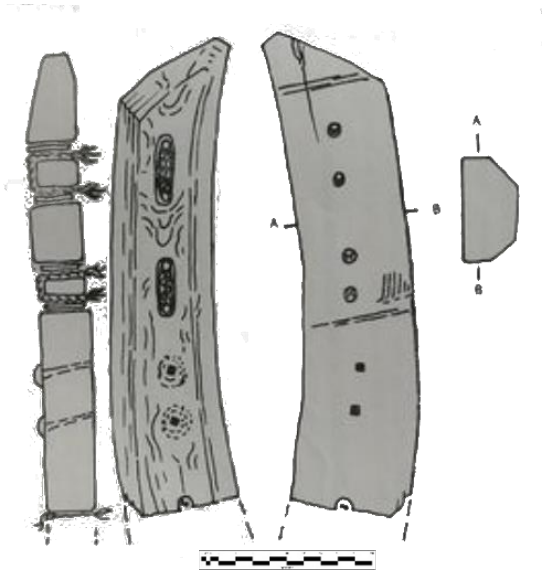


Figure 3.3: Marsala "shield holder" stanchion (After Frost et al. 1981)

There are two likely causes for the absence of shields. Firstly, all shields used on board ancient merchant ships may have been constructed of wood and leather. This squares with Herodotus's and Plutarch's descriptions of ox-hide and wicker shields in Persian, Greek, and Roman navies. According to Polybius, early Roman shields were made of two layers of wood joined by bull's

[356] Frost et al. 1981, 260.
[357] Frost et al. 1981, 260.

hide glue, covered over with calfskin, and finished with an iron rim and boss.[358] While none of these materials preserve particularly well when submerged in seawater, it does seem unlikely that the boss or at least parts of the rim would not have survived on any shipwreck. The only archaeological evidence for the use of bronze in a hoplite shield is seen on the Vatican shield.[359] However, this is an Etruscan replication of the original Greek design, and should not be taken as representative of the shields in other traditions. Alternatively, shields were not used at all aboard merchant ships. With the possible exception of Aristonothos Krater[360], all depictions of their use are military in nature, representing pitched battles between warships. It is entirely possible that merchant vessels simply did not equip themselves thus. Additionally, as has been pointed out in Chapter I (pp. 33, 39-40), the rare passages potentially referring to the use of shields during naval conflicts use terms that may also refer to "armor" in general.

Arrows and javelins were found on relatively few wrecks, only three each.[361] This could have been for any number of reasons, but most likely because they could only be deployed once. In non-military contexts, that they could only be used once likely lowered their value. Furthermore, expert use of these weapons required intensive training. This same reason also could explain the almost complete lack of sling-bullets (only found at **19**, El Sec). As discussed in Chapter I, this was a highly specialized weapon that required years of training to master. It is not unreasonable to think, therefore, that ancient seafaring merchants did not possess the skill to use these weapons at a level that warranted the commitment of resources for their procurement.

[358] Polyb. 6.23.
[359] Bardunias 2008.
[360] Given the equipment of the warriors on the right-hand ship in light of our cataloged information, I do not agree with interpretations arguing it is a merchant vessel.
[361] On the Kyrenia ship, the javelins are thought to have belonged to assailants, not the crew.

When weapons are present, there is a roughly 50/50 split in terms of number of sites on which spears and swords – the two primary melee weapons – are present. While there are 31 spearheads in total as compared to 11 swords, the Uluburun site alone makes up 22 and 4 of these totals, respectively. Therefore, excluding the Uluburun examples, there are roughly even numbers of both weapon types. This is interesting as spears would likely have been a more effective deterrent for boarding because of their longer range. The reason so many weapons were found at the Uluburun site is that the various powerful parties with invested interest in the unique cargo, which contained a vast range and quantity of valuable goods and is often interpreted as representing elite, or possibly palatial, exchange.[362] The fact that Aegean artifacts, including weapons like the Mycenaean swords (**1C3** and **1C4**), 11 spearheads (**1B3** and **1B4**), and knives (**1F2** and **1F6**) appear in pairs in a largely Syrio-Canaanite and Cypriot assemblage has been presented as evidence that two Mycenaeans were on board, possibly tasked with protecting this invaluable cargo.[363]

Geographically, the majority (24 of 31, or 77%) of the shipwreck sites are from the Western Mediterranean, and specifically in and around the Tyrrhenian Sea. While this could be attributed to Etruscan piracy, a closer examination of the sites does not support this interpretation. While there is direct evidence for violence at Spargi with a broken helmet still retaining a human skull, it – along with the vast majority of sites in this region dates to the last three centuries B.C.E. - well after the period in which Greek literary tradition paints Etruscan piracy as a pervasive and one-sided victimization of Greek colonists (c. 800–500 B.C.E.). Instead, they could best be

[362] Bachhuber 2006.
[363] Pulak 2005.

understood in a context of Roman ascendency in the Western Mediterranean, wherein territorial acquisitions in Iberia and North Africa - during the third and second centuries B.C.E., respectively - would have resulted in increased commercial traffic between these areas and the Italian peninsula. Conversely, while the Kyrenia wreck's javelin's, some discovered embedded in the exterior of the ship's hull again suggests a violent encounter, this event cannot be plausibly explained within the context of Cilician piracy as it predates the period in which they were allegedly prolific raiders (295-285 B.C.E. for the wreck as opposed to second century B.C.E. and later for Cilician pirates). This, however, does not mean that the Kyrenia ship does not present compelling evidence for ancient Mediterranean piracy in general. In addition to the weapons cataloged here, a lead curse tablet was found on the site. From a pirate's perspective, the intent was that the mystical influences this artifact invoked would have concealed the evidence of their wrongdoings.[364] As a relatively small merchant vessel with four crewmembers and no apparent armament of their own, the Kyrenia ship would have would have been an appealing prey for raiders seeking an easy score. Even larger merchantmen such as the Spargi ship (**9**, estimated 30 m+ long)[365], with evidence for at least one crewmember who was armed, were at risk of attack. The fragmented skull adhering to the inside of a damaged helmet suggests that at least one sailor died in combat during the time of the sinking event. The literary evidence paints pirates as numerous and well equipped across all periods in the ancient Mediterranean. In turn, the archaeological evidence suggests most private merchant vessels were aware of this fact, yet they armed themselves only lightly against opportunistic attack, and likely sought to evade pirates rather than fight them. The exceptions to this rule are ships with evidence for royal or

[364] Katzev 2007.
[365] Parker 1992, 409.

state sponsorship like the Uluburun and Albenga ships, whose government backing allowed for more determined protection of their cargoes.

In this study, we assembled 31 sites and documented 201 individual weapons or pieces of armor, including stone and lead projectiles, grapnels, a dolphin, arrowheads, javelins, spears, swords, axes, maces, daggers/knives, helmets, cuirasses, scale armor, and a leather garment. documented. By analyzing find numbers and proportions, as well as chronological and geographic distributions, we were able to identify patterns in merchant vessel armaments across our target time-span of the Late Bronze Age to 1 B.C.E. Helmets proved to be a consistent find, while weaponry varied but remained light on ships across time-periods. We were able to provide a tenable answer to our principle research question concerning how ancient merchant vessels in the Mediterranean equipped themselves against attack at sea. While the occasional exception like the Uluburun and Albenga vessels present themselves (an inevitability given the scope of our research), the recurring picture tends to be one of private merchant vessels prioritizing light armor and the ability to evade aggressors, with only enough weaponry on board to dissuade the most opportunistic attackers. Unfortunately, our body of evidence was not large or varied enough to provide plausible answers to our ancillary research questions regarding the ambiguous relationship between sword typology and literary terminology. As more sites with relevant material are discovered, ideally in regions and time-periods where data are currently sparse like the Early Iron Age Aegean, our understanding of how ancient Mediterranean vessels armed themselves while at sea can only improve.

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